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THE WILSON BULLETIN
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Vol. 53 JUNE, 1941 No. 2

REMARKS ON THE BIRDS OF ANTICOSTI ISLAND

BY HARRISON F. LEWIS

SINCE my first visit to Anticosti Island, Quebec, in June, 1922, I have returned to that island from time to time. In a published paper (Lewis, 1924) all records of the birds of Anticosti that were then available were brought together and evaluated. My subsequent observations of the birds of that island that seemed worth recording have appeared in an irregular series of brief notes (Lewis, 1925, 1926, 1927, 1938a, 1938b). This series of publications is continued in the present paper, the first part of which consists of records based on observations that I made on and near Anticosti during the week of June 5 to 11, 1940. The

Figure 1. A section of the nesting colony of Kittiwakes at Gullcliff Bay. (National Museum of Canada photograph.)

second part of this paper is concerned with another recent publication on the birds of that island (Braund and McCullagh, 1940).

I arrived at Port Menier, near the west end of Anticosti, on June 5, 1940. On June 7, through arrangements kindly made by Mr. H. E. Graham, Resident Manager of the island, I left Port Menier in a small motorboat for a cruise along the island's north shore, to East Point and return, for the purpose of observing the seabird colonies situated on that coast. This motorboat was the property of the Consolidated Paper Corporation, which owns Anticosti, and was in regular use for patrols and local transport around the island. It was operated by three of the Corporation's employes, chief of whom was the Skipper, Charles McCormick. These men had had many years of experience in navigating small boats around Anticosti and knew the coast in great detail. East Point was reached on June 9 and the return to Port Menier was completed on June 10. Early on the morning of June 12 I left Anticosti.

To the Consolidated Paper Corporation, to Mr. Graham, and to Skipper McCormick and his crew I express my sincere thanks and appreciation for their valuable co-operation and assistance.

Certain observations made during this visit to Anticosti are presented hereunder, arranged according to the species of birds to which they have reference. Three species that are here recorded from Anticosti for the first time are marked in this list with an asterisk.

Moris bassana. Gannet.—On June 9, beginning at 5:30 A.M., I visited the nesting colony of Gannets and other seabirds at Gullcliff Bay, about 3 miles northwest of East Point. The sea was smooth, so our small motorboat could approach close to shore. At my request, the boat was made to pass slowly along and close to the precipitous cliff, 116 feet high, on which the birds were nesting. Whenever I desired it, the boat was stopped and permitted to drift idly for as long a time as necessary. Such a slow passage along the full extent of this great bird colony was made four times on this occasion. In this way I was able to make a very detailed examination of the colony and to determine with much accuracy the numbers of the Gannets.

The Gannets present were counted carefully during the first passage along the colony, when they were comparatively undisturbed, and were found to number 838. These were all either in fully adult plumage or in the plumage of the fourth year, characterized by a few black feathers scattered among the white. Birds in both of these plumages commonly breed. The Gannets' nests on the cliff were counted with equal care during later passages in front of the colony and were found to number 496. Nests of this species are comparatively easy to count in this colony because they are scattered on many small ledges. It is possible that a few of them were overlooked, for the morning was cloudy and the light was not strong, but it is believed that the number stated is substantially correct. Some observations were made, a little later, from

the top of the cliff, but it was found that many of the Gannets' nests could not be seen from that position.

The number of nests counted indicates a breeding population of 992 Gannets. The 838 Gannets that were present when the cliff was first examined, between 5:30 and 6:00 A.M., therefore constitute approximately 84 per cent of the total breeding population of the colony.

Later in the summer of 1940 Mr. John Osborne, who resided at Fox Bay, Anticosti, for many years and left there in 1907, told me that during his residence at Fox Bay no Gannets nested at Gullcliff Bay, which he was accustomed to visit frequently. As Captain Oscar Mercier stated (Lewis, 1924) that the Gannet colony at Gullcliff Bay had been seen by him in 1913 and subsequent years, it appears probable that this colony was founded between 1907 and 1913.

Since P. A. Taverner reported (1929) that this colony contained "about 500 nests" when seen by him in 1928, it does not appear to have increased since that time. It seems, indeed, unlikely that the Gannet population in this colony will increase much, unless the Gannets drive away European Cormorants and occupy their ledges, for most of the ledges big enough for these large species are already occupied by one or the other of them, while extension of the colony onto the open land back of the top of the cliff is presumably prevented by Anticosti's population of foxes, black bears, and white-tailed deer.

Phalacrocorax carbo carbo. European Cormorant.—The occupied nests of this species on Anticosti (on suitable coastal cliffs on the north shore of the island from Cape Observation to East Point) were carefully counted on June 8 and 9 and found to number 605, representing a breeding population of 1,210 birds. Greater detail concerning observations of this species is being published in another connection.

Dafila acuta tzitzihoa. American Pintail.—This species was observed only in a small wooded swamp near Port Menier, between the village and the principal group of farm buildings. On June 5, I found on a small pond in this swamp four Pintails, of which at least two were adult drakes. On June 11, while I was standing in full view near the same pond, a female Pintail, quacking repeatedly, deliberately flew in and alighted on it and then, jerking nervously, swam toward me. I remained quiet and after a while she flew away.

Nettion carolinense. Green-winged Teal.—On June 6 three drake Green-winged Teal were seen on the pond near Port Menier on which the Pintails had been seen on June 5.

Nyroca (marila?). (Greater?) Scaup Duck.—A number of pairs of Scaup Ducks seen near Port Menier on June 5, 6, and 11, are believed to have been Greater Scaups. The sides of the drakes were white, greenish gloss was repeatedly observed on the head of one drake and the broad band of white displayed on the wings when the birds were flying was seen to extend well out onto the primaries. These birds were

in the same locality in which I saw Scaup Ducks on June 10 and 14, 1922 (Lewis, 1924). The Scaups seen in June, 1940, occurred as follows:

June 5—Four pairs.

June 6—One pair.

June 11—Two pairs and one group of three drakes and a duck.

Sometimes the Scaups were seen on the small lake, officially named Gamache Lake but locally known as Lake St. George, that is close behind the village of Port Menier; sometimes they were in a small shallow pond, apparently of a temporary character, in a hayfield near the lake.

Active courtship on the part of one pair was observed through a 6x binocular on June 5, for about twenty minutes, at a distance of about 300 feet. The drake would dive close to the female and immediately come up again in another position close to her. Repeatedly, with head and neck outstretched, he rushed at her across the water, and on each such occasion she rushed equally fast away from him in a similar manner, but she did not leave him or attempt to fly away. I heard no notes uttered during these performances, but one drake, when flushed with his mate, cried *squarrow, squarrow* repeatedly, in a loud, hoarse, complaining voice, as he flew away. When, a few minutes later, this pair flew back to the pond where I had first seen them, the drake again uttered his cry a number of times.

Melanitta deglandi. White-winged Scoter.—

Melanitta perspicillata. Surf Scoter.—

Oidemia americana. American Scoter.—

During my voyages along the coast of Anticosti by motorboat, the vibration of the boat was often so great as to interfere seriously with the use of a binocular for detailed observation of birds at a distance. For this reason many of the scoters, other than White-winged Scoters, that were seen were not identified specifically. Because, however, of the inadequacy of available records of scoters at Anticosti, it seems advisable to set forth here all my records of these ducks in the vicinity of that island as observed during my visit in June, 1940.

June 5—West Point to Port Menier: White-winged Scoter, 100; other scoters (sp.?), 17.

June 7—Port Menier to West Point: White-winged Scoter, 17.
West Point to Cap de Rabast: scoters (sp.?), 650 (a few White-winged, the rest apparently mostly American).
Cap de Rabast to Brig Harbour: White-winged Scoter, 70; Surf Scoter, 6.
Brig Harbour to MacDonald River: scoters (sp.?), 7.

June 8—MacDonald River to Cape Observation: scoters (sp.?), 6.
Vauréal River to Salmon River: scoters (sp.?), 18.
Salmon River to Fox Bay: White-winged Scoter, 6; scoters (sp.?), 400.

June 9—Fox Bay to East Point: scoters (sp.?), 70.

Bonasa umbellus. Ruffed Grouse.—This species, originally introduced near Port Menier a few years before 1926, has now, I am told, spread throughout the entire wooded area of Anticosti. It is interesting that it has been able to do this in spite of the unusual abundance of foxes on this island.

In 1940, I flushed two Ruffed Grouse on Anticosti, one on June 7 at MacDonald River, and one on June 11 near Port Menier. Both of these birds had gray tails.

Charadrius semipalmatus. Semipalmated Plover.—Ninety were observed at Port Menier on June 5. As none was seen on Anticosti during the rest of my stay, it is probable that the observation recorded marks the termination of the spring migration of this species at this place.

Lobipes lobatus. Northern Phalarope.—As this is another species that has been very inadequately recorded in the vicinity of Anticosti, my observations of it there in 1940 are set forth in full.

June 7—West Point to Cap de Rabast: a flock of 130 and a flock of 80.

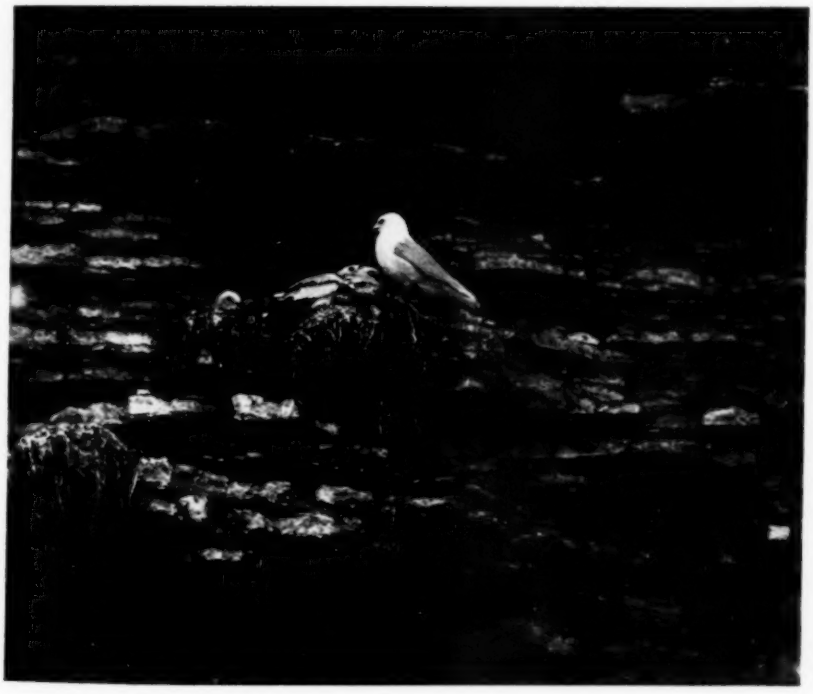

Figure 2. Kittiwake nests at Gullcliff Bay. (National Museum of Canada photograph.)

June 10—East of Brig Harbour and within 5 miles of that place: a flock of 300, one of 50, one of 30.

Cap de Rabast: a flock of 5.

Rissa tridactyla tridactyla. Atlantic Kittiwake.—During my close and repeated examination of the seabird colony at Gullcliff Bay on June 9, I estimated the Kittiwake population of the cliff, section by section. The final conclusion reached is that, as well as I could judge, the total number of Kittiwakes then present was about 9,200, the total number of occupied Kittiwake nests was about 7,500, and the total number of Kittiwakes nesting in this colony was therefore about 15,000. As these estimates were made in the early morning, it appears reasonable and in accord with them that many of the Kittiwakes of the colony should be absent at that hour in search of food.

On a cliff at East Point, which was also visited on June 9, is a colony of Kittiwakes that was estimated to contain about 500 breeding birds.

Sterna (sp.). Tern.—Near the mouth of the Salmon River, on June 8, five terns, either Common Terns or Arctic Terns, but believed to be the former, were observed on small hummocks that formed little islets in a pond in a bog. The terns acted as if they were nesting there or intended to nest there. The only reason for mentioning this observation here is that two of these birds were seen perched on trees. One was perched on the slender, swaying top of a small tamarack (*Larix laricina*) that grew on one hummock; another was perched on the somewhat stiffer top of a small spruce tree (*Picea* sp.) on a neighboring hummock. I do not know of any other instance of Common or Arctic Terns perching on trees.

Uria aalge aalge. Atlantic Murre.—A few small groups of this species were seen incubating, on June 9, on some of the broader ledges of the cliff at Gullcliff Bay. I estimated the total number of Atlantic Murres in this colony to be about 220.

Tyrannus tyrannus. Eastern Kingbird.—At Fox Bay on June 8 I plainly saw a Kingbird on two occasions, about 2½ hours apart. This bird was frequenting rotting kelp on the beach, doubtless to obtain small flying insects.

On June 11, I saw two Kingbirds together near the farm at Port Menier. This suggests the possibility of their nesting there.

There are previous records of four Kingbirds on Anticosti.

Hirundo erythrogaster. Barn Swallow.—On June 11, I saw a pair of Barn Swallows resting on a wire at L'Anse aux Fraises, or Strawberry Cove, where I saw a pair of this species on July 16, 1938 (Lewis, 1938b).

Later on June 11, 1940, Mr. Ted McCormick, a resident of Port Menier, showed to me, in a large barn at that place, a clearly recognizable nest of the Barn Swallow. He said that this nest was built in

1939. There were no Barn Swallows in its vicinity at the time when I saw it.

Petrochelidon albifrons albifrons. Northern Cliff Swallow.—On June 5 and again on June 11 I saw one Cliff Swallow flying about near Port Menier.

Mr. Ted McCormick, of Port Menier, told me that several pairs of Cliff Swallows nested in 1939 under the eaves of one of the barns at that place. I did not see any actual evidence of such nesting.

Regulus satrapa satrapa. Eastern Golden-crowned Kinglet.—One singing male was observed between Port Menier and L'Anse aux Fraises on June 11.

Bombycilla cedrorum. Cedar Waxwing.—I saw three birds of this species at Port Menier on June 11.

**Sturnus vulgaris vulgaris*. Starling.—In mixed woods beside the little-used Canard Road, about 2 miles southeast of Port Menier, I obtained excellent observations of two Starlings, a short distance apart, on June 5. One of these birds remained near a dead birch stub, which was about 10 inches in diameter and was marked, between 20 and 25 feet from the ground, with four old holes apparently made by Downy Woodpeckers. This Starling scolded me angrily for some time, suggesting that it may have been nesting in one of those holes.

This is the first record of the Starling on Anticosti. I was much surprised to discover it in little-frequented woodland, rather than in the village of Port Menier.

**Vireo philadelphicus*. Philadelphia Vireo.—On the morning of June 8, in poplar woods on a low ridge near the mouth of the Vauréal River, I found a Philadelphia Vireo, singing steadily. It was clearly seen at close range through a 6x binocular, its characteristic markings were noted with care, and its identity was established with certainty. I timed the rate of its singing and found that it was uttering 33 song-phrases per minute. On the morning of June 10 a Philadelphia Vireo, presumably the same individual, was heard singing on the same ridge. This species has not previously been recorded from Anticosti.

Vermivora ruficapilla ruficapilla. Nashville Warbler.—A singing male was observed at Fox Bay on June 8 and two singing males were observed near Port Menier on June 11. Previously this species had been recorded on Anticosti only on June 13, 1922, at Port Menier (Lewis, 1924).

**Dendroica tigrina*. Cape May Warbler.—On the morning of June 10, in mixed woods near the mouth of MacDonald River, a male of this species was singing repeatedly. Recognizing its song, I followed it about for some time and eventually succeeded in seeing it in the clear morning sunshine and identified it by sight as well as by sound. This is the first record of this warbler on Anticosti.

Melospiza lincolni lincolni. Lincoln's Sparrow.—Two individuals were heard singing at Port Menier on June 5.

* * * *

I now turn with reluctance to the task of offering some critical comment on certain aspects of a recent paper on the birds of Anticosti (Braund and McCullagh, 1940).

Included in this paper are some quotations, attributed to previous publications, that are related to the matter in hand very distantly or not at all. Even though we grant that in a list of the birds of Anticosti there may be some possible reason for quoting from the "Catalogue of Canadian Birds" (Macoun and Macoun, 1909) a statement that the Razor-billed Auk "breeds, but not in large numbers, on the Great Bird rock, Bryon island, and Entry island, Magdalen islands, Gulf of St. Lawrence," there does not seem to be any occasion for including in such a list the following remarks about the American Eider:

"Lewis (1930) writes, 'large batch of American Eiders observed along south shore of Labrador Peninsula in 1929.' Townsend (1916) translating Beetz's notes writes, 'American eiders have been in the habit of nesting on the isles of the Gulf'."

These quotations do not refer to Anticosti and add nothing to our knowledge of the status of the Eider there. Incidentally, the statement cited from a paper by the present writer, though presented as a direct quotation, is not to be found at the place referred to, where the remarks made are: "This species prospered along the south shore of the Labrador Peninsula in 1929. The hatch of young Eiders was a large one . . ."

Perhaps the most remarkably inapposite of the quotations published in the Anticosti bird list under discussion is the following, which is included in the paragraph about the Eastern Goldfinch:

"Henry Mousley (1932) found this species common on August 23, near St. Lambert, Quebec, and states that many nest."

St. Lambert is a suburb of Montreal, in the Transition Zone, more than 500 miles from Anticosti, which is partly in the Canadian Zone and partly in the Hudsonian Zone. What the status of the Goldfinch at St. Lambert has to do with its status on Anticosti is a mystery. Mr. Mousley, in numerous papers, has published a great deal of detailed information about the birds of southern Quebec. Why his passing comment, at the place cited, that "On this day (August 23, 1931) I was out with my friend Mr. Terrill near St. Lambert when we saw many nests of the eastern Goldfinch (*Spinus tristis*) . . ." should be chosen for reference in a list of the birds of Anticosti, while all his other published records of the birds of southern Quebec, in this paper and others, are very properly omitted from that list, is a mystery even deeper than the first.

Such references in this paper cannot fail to make the reader wonder how the search of the literature incident to its preparation was carried on.

Under the name "*Hylocichla ustulata almae* Oberholser. Alma's

Thrush" these authors state, in part, "One of the most interesting discoveries arising from the study of our collection was that the Olive-back Thrush of Anticosti Island belongs to the Rocky Mountain race. . . . It will be interesting to see whether examination of specimens of *Hylocichla ustulata* from northern Ontario and Quebec will show that *H. u. almae* has an unbroken range across northern North America, from the Rocky Mountains to the Gulf of St. Lawrence."

Under the name "*Melospiza georgiana ericrypta* Oberholser. Western Swamp Sparrow" they state, in part, "The discovery that the breeding Swamp Sparrows of Anticosti Island are *Melospiza georgiana ericrypta* Oberholser (1938) extends the range of that supposedly western form from the prairie region of Canada to the Gulf of St. Lawrence, and is one more example of the discovery in northeastern America of subspecies first described from the west. It still remains to be demonstrated, however, that the ranges of these western forms across Canada to the Atlantic Coast are continuous."

Hylocichla ustulata almae and *Melospiza georgiana ericrypta* are names not to be found in any edition of the A.O.U. Check-List. The latter name, having been proposed in 1938, was not available when the Check-List was published, but the former, which was proposed in 1898, was presumably considered and rejected by the Committees that prepared the Third (1910) and Fourth (1931) Editions of the Check-List. As far as the mere question of use, in a faunal list, of names in such categories is concerned, some will consider it undesirable, yet it may be justified as an exercise of that liberty in science properly pertaining to the publishers of carefully-formed opinions.

To assume and state, without further evidence, that the representatives of *Hylocichla ustulata* and *Melospiza georgiana* that inhabit Anticosti Island, in the Gulf of St. Lawrence, belong, respectively, to races of those species whose known range had previously been restricted to distant regions is, however, a very different matter. It brings into question the fundamental concept of the subspecies.

Before the general acceptance of an evolutionary view of living creatures, it was customary to classify them, for practical convenience, like artifacts, on a basis of physical similarity. The resulting "systems" differed so basically in their aim and form from those accepted at present that they have become mere historical curiosities.

Modern classification is arranged to serve the primary purpose of expressing *genetic relationship*, as far as that has been ascertained or rationally inferred. Morphological features are still utilized in arranging our classifications, but are properly so utilized only as indications, albeit often the principal ones available, of what the genetic relationships actually are.

A subspecies, then, is not essentially a group of conspecific individuals that possess in common certain morphological distinctions, but

is a group of conspecific individuals that possess among themselves a *common genetic relationship* that:

(1) relates them to one another more closely than to individuals in any other group within their species;

(2) is indicated by the presence, in most of the individuals concerned, of the heritable morphological distinctions that accompany it;

(3) is made to appear more probable by auxiliary evidence, such as appropriate spatial or geographical occurrence.

It follows that, to determine the subspecific position of an individual specimen or of a number of specimens, it is not sufficient to set up, as it were, a series of sieves calculated to sort out morphological characteristics, and to pass our specimen or specimens through them and conclude that any specimen corresponding to sieve "A" is, by that very fact, subspecies "a"; any specimen corresponding to sieve "B" is subspecies "b," and so on. It is also necessary to present at least a reasonable likelihood that the morphologically similar specimens do possess among themselves a genetic relationship closer than that existing between them and any other similarly differentiated group. This likelihood is commonly indicated in practice by the fact that the specimens possessing the morphological distinctions in question have been obtained from an ascertainable unbroken range.

When specimens with identical or closely similar morphological characteristics of subspecific value are found in different ranges, not known to be connected, and known to be separated, in the region directly intervening, by a different subspecies of the same species, this fact renders it doubtful if they possess that close genetic interrelationship that alone would constitute them members of one subspecies. Subsequent investigations may reveal that, by some indirect route, what originally appeared as two distinct ranges are actually joined as portions of one unbroken range, but, until that has been shown, it is the part of proper scientific caution to refrain from stating that such morphologically similar but geographically separated populations are of one and the same subspecies.

The fact that the Swamp Sparrows of Anticosti Island may be found to be morphologically indistinguishable from those of Manitoba, more than 1,300 miles away, does not constitute them all one subspecies if the intervening breeding-grounds of this species are occupied by individuals that form a different subspecies. Such a situation indicates that it is quite probable that the Anticosti Swamp Sparrows and the Western Swamp Sparrows evolved independently from a common stock to subspecific status and have not since interbred. If that be actually the case, they are not one subspecies, but two, even though they be morphologically identical.

Practical convenience has no standing as a pleader on this question. It would doubtless make matters much simpler for the systematist to

deal only with the present measurable morphological features of living creatures, but the day for such simple science has passed. Now that the main object of our classification is not the convenience of the scientist but is the expression of genetic relationships developed in the course of the evolution of living things, we are not justified in omitting consideration of any available evidence that, in the light of present knowledge, assists in indicating those relationships. This evidence seldom is restricted to the morphological and usually includes the geographical.

These views are not new, but the statements quoted from the paper under discussion indicate that there is need to emphasize them again. An able commentary on the subject by the late Dr. Joseph Grinnell is cited below (Grinnell, 1918).

Summary

Notes of special interest concerning the occurrence on Anticosti Island, Quebec, of 24 of the bird species observed there by the author during the period June 5 to 12, 1940, are presented.

Sturnus vulgaris vulgaris, Vireo philadelphicus, and *Dendroica tigrina* are recorded from Anticosti for the first time.

Certain features of a recent paper on the birds of Anticosti Island (Braund and McCullagh, 1940) are discussed. Objection is taken to the unsupported assumption of the subspecific identity of conspecific populations possessing close morphological similarity but occurring on ranges widely separated by the range of a different subspecies.

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DEPARTMENT OF MINES AND RESOURCES, OTTAWA, CANADA

AN EIGHT-WINTER STUDY OF CENTRAL IOWA BOB-WHITES [1]

BY PAUL L. ERRINGTON[2]

THE winter behavior and survival of central Iowa Bob-whites (*Colinus virginianus*), 1932-35, has been discussed at some length in earlier publications (Errington, 1936b; Errington and Hamerstrom, 1935; 1936). Data for five years more, 1935-40, in combination with those previously acquired, delineate a population curve that not only begins and ends with abundance peaks but also depicts seasons of scarcity. What this curve may have in common with the periodic fluctuations of grouse (Tetraonidae) and hares (Leporidae) of Canada and northern United States may be difficult to judge, but its amplitude, at least, should make it of interest from the standpoints both of conservation and biological science.

Tables 1 to 3 summarize Bob-white census figures obtained from four central Iowa areas. Techniques of investigation used were largely those of direct enumeration and "reading of sign" that have proved suitable for regular studies in this region (Errington and Hamerstrom, 1936: 310-333). Helpful information was contributed by farmers and other persons living in the vicinity of Ames; and notes taken by employees of the Des Moines Waterworks Supply Grounds (mainly by Messrs. Ben Baltzley, Lee Simmons, and Martin Haines, and made available through the courtesy of Mr. A. F. den Boer) are of supplementary value.

The Bob-white, being as a species sedentary and gregarious within limits (Stoddard, 1931; Errington and Hamerstrom, 1936), may be rather easily counted under winter conditions prevailing in north-central United States, but the validity of population figures may be affected by lack of tracking snows, by imperfectly ascertained movements of birds across the boundaries of observational areas, by interruptions of local censuses necessitated by more urgent demands of work elsewhere, and by undetected losses as from poaching. Hence, when for any reason the tabulated data are believed to be of less than standard quality, appropriate notations are added for the guidance of the reader.

Of the observational areas, the one at Des Moines (Table 1) was characterized by relatively constant environmental conditions. Non-agricultural land, it had growing on it few of the crop and weed plants of cultivation upon which the Bob-white are so largely dependent for winter food (Errington, 1936a), but this deficiency was offset by the proximity of food-bearing private fields and gardens and by feeding

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TABLE 1

Bob-white Wintering Densities, City Waterworks Supply Grounds, Des Moines, Iowa, 1932-40

Winter	Date or time of season to which census figures most closely apply	Sample area of 300 acres under regular observation		Entire Waterworks area of 1506 acres plus about 80 acres of adjacent farm land Figures from miscellaneous sources
		Only territory having known boundaries completely within sample area	Entire sample, including parts of borderline, hence imperfectly defined territories	
		Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard
1932–33	Mid-Nov.	62 fair data	92 fair data	176 fair data
	Dec. 16	59	109 fair data	177 fair data
	Jan. 26	57 fair data	no data	no data
	Feb. 8	55	98	139 questionable data
	Mar. 21	55	55	no data
1933–34	Dec. 8	59	109	261 fair data
	Jan. 20	63	126	241 questionable data
	Feb. 27	49	109	215 fair data
1934–35	Nov. 23	60	82	no data
	Early Dec.	40	62	171 fair data
	Mid-Jan.	31	31	134 fair data
	Feb. 9	20	32	59 fair data
	Mar. 1	21	33	85 fair data
1935–36	Early Nov.	68 fair data	81 fair data	155 fair data
	Early Jan.	71 fair data	115 fair data	204 fair data
	Early Feb.	63 fair data	75 fair data	157 fair data
	Mid-Feb.	31 fair data	31 fair data	no data
	Late Feb.	27 fair data	27 fair data	69 fair data
1936–37	Late Nov.	40	48	
	Mid-Dec.	53	101	no data
	Late Jan.	23	23	
	Feb. 5	11	37	
	Feb. 16	9	9	
1937–38	Nov. 19	31	74	
	Dec. 21	48	84	no data
	Jan. 20	39	78	
	Feb. 23	49	66	
1938–39	Mid-Nov.	50 fair data	62 fair data	150 fair data
	Dec. 5	51	51	141 fair data
	Dec. 31	44	53	154 fair data
	Jan. 18	50	74	186 fair data
	Early Feb.	53 fair data	101 fair data	242 fair data
1939–40	Early Jan.	54 fair data	74 fair data	156 fair data
	Feb. 5	56	72	119 questionable data
	Mar. 11	26 poor data	34 poor data	no data

stations maintained by the waterworks staff. Brushy refuge cover was generally excellent in places intended for native wildlife, and the latter was given police protection from human interference. In contrast, the areas near Ames and Story City (Tables 2 and 3) were typical farm lands for which habitability for Bob-white—as concerned food and cover, at any rate—varied much from year to year and according to crop rotation as well as to differences in practices such as tree cutting, debrushing of fence rows and roadsides, plowing, and pasturing.

Population Stability

Stoddard (1931: 167-182) found that a favored area of ground in the southeastern states may be occupied by similar numbers of Bob-whites year after year, even when the composition of coveys may greatly change; and this is in keeping with the results of studies in the north-central states from 1929 to 1935 (Errington and Hamerstrom, 1936).

The latter authors listed 119 instances in which trends toward uniformity of local population levels were apparent. In 69 of these, the trends had become manifest at the beginning of the winter; in 43, through winter reduction of "surplus" birds; and, in 7, through the filling of habitat vacancies in the course of the winter. Of the central Iowa data, only those from a few well defined Bob-white range units under regular observation for many winters are strictly eligible for consideration in this connection.

It may be seen that the single territory lying within the 300-acre sample area at Des Moines (Table 1) usually accommodated between 50 and 60 birds from December to February. The decline of 1934-35 was due to experimental manipulation; that of 1935-36, to one of the most severe winter crises on record; and that of 1936-37, to egress and establishment of quarters just off the territory, which in turn was probably induced by low Bob-white densities existing on the area as a whole.

In Table 2, the principal territory west of Skunk River wintered in the neighborhood of 20 birds three of the four winters that it had initial populations up to or over that number; in the fourth winter, 1934-35, the decline seemed non-lethal and associated with population phenomena later to be discussed. The territory east of Skunk River shows little that looks like uniformity, perhaps in part because of pronounced annual variations in the winter-available food supply.

The one territory along Squaw Creek (Table 3) wintered close to 40 birds during three of the four winters it was well filled at the start; the 1934-35 decline was a clear case of eviction as a consequence of practically the entire food supply being plowed under in the fall. The limited data from the Story City area have a bearing upon the possible competitive status of the Ring-necked Pheasant (*Phasianus colchicus torquatus*) and will again be referred to.

TABLE 2

BOB-WHITE WINTERING DENSITIES OF THE SKUNK RIVER BOTTOMLANDS SOUTHEAST OF AMES, IOWA, 1932-40

Winter	Date or time of season to which census figures most closely apply	Territories usually occupied if Bob-whites winter in their vicinity		Entire area of about 1000 acres under observation
		Principal territory west of Skunk River	Principal territory east of Skunk River	
		Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard
1932–33	Early Dec.	43	61	129
	Jan. 30	43	61	129
	Feb. 27	23	61 fair data	109 fair data
	Mar. 20	22	59	105
1933–34	Jan. 13	38 fair data	30 fair data	133 fair data
	Feb. 27	21 questionable data	0 fair data	58 questionable data
1934–35	Mid-Nov.	42	13	72
	Mid-Dec.	25	16 fair data	58
	Jan. 23	14	13	27
	Feb. 1	13 fair data	12 fair data	25 fair data
	Mar. 1	7	2	9
1935–36	Mid-Jan.	6 fair data	14	44 fair data
	Feb. 6	0 fair data	8 questionable data	43 fair data
	Feb. 11	0	9 fair data	41 questionable data
	Feb. 19	0 fair data	0 poor data	40 poor data
1936–37	All winter	10 poor data	0 poor data	10 poor data
1937–38	Dec. 10	0	0	12
	Dec. 23	9	0	9
	Middle and late winter	9 fair data	0	9 fair data
1938–39	All winter	12 poor data	30 to 40 poor data	40 to 50 poor data
1939–40	Dec. 28	28 fair data	44 questionable data	115 fair data
	Jan. 26	32	37 fair data	124 fair data
	Feb. 28	17 fair data	7	92 fair data

Population maxima on the above central Iowa wintering territories were largely delimited in "good quail years" by what has been called the "carrying capacity" of the land or "the level beyond which simple predation upon adult birds, their own territorial intolerances, and their tendencies to depart from coverts over-crowded with their own or some other species do not permit continued maintenance of population"

(Errington and Hamerstrom, 1936: 309). Numerical values for carrying capacity usually differed with the locality but typically remained about the same from one winter to the next on specific areas unless significant changes in environmental equations took place—*sometimes despite profound modifications in food and cover relationships.*

Food is linked with carrying capacity in the sense that enough high grade food must be available to attract, hold, and sustain the birds. The 1934-35 data for the Des Moines and Ames territories of Tables 1 and 3 reflect the abandonment of otherwise suitable habitat that may be expected when this minimal requirement is not met; but, on Midwest agricultural lands, the amounts of Bob-white foods are commonly in excess of needs except in the event of emergencies unrelated to carrying capacity as the latter has been defined. Carrying capacity may likewise be conditioned by quality and distribution of brushy cover, but individual coveys may vary astonishingly in their preference for, or dependence upon, different cover types. Certain coveys may find untenable brushy cover that may look adequate or superior to human eyes, whereas others may find habitable many patches of sparse brush or corn fields having no more cover than that provided by stalks and weeds. The declines shown by the Skunk River (Table 2) and Squaw Creek (Table 3) census figures for 1934-35 and 1939-40 were partially attributed to coveys moving to food-rich but generally cover-poor uplands situated away from the streams and outside of the observational areas.

Predation borne by wintering northern Bob-whites tends to be of incidental nature and of intensity governed by the degree of vulnerability of the birds, themselves, rather than by kinds and numbers of predators (Errington and Hamerstrom, 1936; Errington, 1937)[3]. Although populations above the carrying capacity of the land are preyed upon with conspicuous severity, carrying capacity functions as a threshold of security below which the numbers of wintering birds can rarely be forced very far through attacks of wild predators alone. Winter losses from predation on the Des Moines 300-acre sample (Table 1) have been consistently negligible. In the vicinity of Ames, the territory west of Skunk River (Table 2) lost birds from predation chiefly in 1932-33; the Squaw Creek territory (Table 3), in 1932-33 and 1939-40. On other parts of the 4200-acre Squaw Creek area, two covey groups in 1934-35 and two in 1939-40 lost considerably from predation, but the data on carrying capacities of their habitats are insufficient to permit further evaluation in this writing.

Weakness, as from injuries or hunger, may of course predispose birds to capture by enemies even when no state of overpopulation exists,

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[3] In southeastern states, Bob-white and predator relationships may differ materially from those described for the north-central region and reveal less flexibility (Errington and Stoddard, 1938).

TABLE 3

Bob-white Wintering Densities of Farm Lands Bordering Small Streams Near Ames and Story City, Iowa, 1932-40

Winter	Date or time of season to which census figures most closely apply	Area of about 4200 acres situated mainly within one mile of Squaw Creek, north and northwest of Ames		Square mile of land south of Story City having suitable habitat only in one corner
		Only well-defined territory under regular observation for full period	Entire Area	
		Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard
1932–33	Dec. 17	48		
	Jan. 29	44	no data	no data
	Mar. 4	42		
	Mar. 19	42		
1933–34	Dec. 13	42		
	Early Jan.	43	no data	no data
	Feb. 27	38 fair data		
1934–35	Early Dec.	53	156	no data
	Early Jan.	7 fair data	no data	23
	Late Jan.	0	127	38 fair data
	Feb. 20	0	88	no data
	Mar. 8	0	57	31
1935–36	Nov. 28	19		no data
	Dec. 16	21	no data	no data
	Jan. 15	18		20 poor data
	Jan. 30	8		no data
	Feb. 20	4		no data
1936–37	Early Dec.	8	19 questionable data	0 fair data
	Jan. 7	6	no data	0 fair data
	Feb. 14	6	15 questionable data	0 fair data
1937–38	All winter	0	12 questionable data	15 poor data
1938–39	Early Dec.	18	45 fair data	12 to 15 all winter —poor data
	Mid-Jan.	26	39 questionable data	
	Mar. 2	10	39 questionable data	
1939–40	Late Dec.	47	231	18 fair data
	Jan. 20	31	180	15 fair data
	Early Feb.	36	157	15 fair data
	Late Feb.	40	170	15

and man may still be able to exploit populations that less-equipped predators had long found essentially unavailable.

The influence of species psychology on population levels of the Bob-white is a subject so beset by unknowns and variables that we find it hard to say how much the 1935-40 data may have to add to what has already been published (Stoddard, 1931: 167-182; Errington and Hamerstrom, 1936: 366-405; Errington, 1937). The manifestations and consequences of overcrowding may be spectacular, and there is no question that birds harassed by their fellows or forced into inferior habitats may be confronted by lethal disadvantages; to explain why limits of toleration should be definite for a given area for many winters in succession yet different on different areas is another matter, however, particularly when about the only uniformity to be seen in a local situation may relate to maxima of birds annually tolerated.

Intraspecific behavior was best studied at Des Moines, where an exceptionally stable habitat was kept filled with Bob-whites close to its evident capacity for the greater part of six or eight winters, or the whole 1932-40 period except 1934-35 and 1936-37. In all years, preliminary adjustments indicative of toleration limits on the main territory had occurred by late November or December (Table 1). Four to six coveys occupied this common territory—which was something of an ecological island of between 140 and 160 acres—during "saturation" winters, but continuous splitting and recombining of coveys and fluidity of movements seldom left coveys with any particular identity for more than a few days at a stretch, though in many ways the total population reacted as a group. Coveys from outside entered the filled-up territory on occasion, but either they did not remain or an equivalent number of birds soon departed.

Autumnal fighting between coveys has been noted alike for the Valley Quail (*Lophortyx californica vallicola*) in California (Emlen, 1939: 129) and for the Bob-white, and both species may violently exclude strangers from covey groups. Avoidance of fully populated coverts by excess birds may occur without manifestations of animosity and sometimes after close associations terminated by birds segregating into their original coveys and going their respective ways. Bob-whites of the north-central states may also, and seemingly without direct compulsion, avoid concentrations of Ring-necked Pheasants and other conspicuous animal life. Bob-whites of underpopulated areas, such as the one at Des Moines in 1936-37 (Table 1) and the two near Ames from 1934-35 to 1938-39 (Tables 2 and 3), were generally more mobile than residents that were unable to go so far without trespassing in occupied territories.

What appear to be changes in habitability of Bob-white environment may be due chiefly to increased experience of the birds as the winter progresses. Few coveys were found more than a mile from central Iowa streams at the beginning of the winter, except those fairly well situated about farm groves or the occasional grapevine tangles

along fence rows, and similar places; in late winter, 1934-35 and 1939-40, it was not unusual to encounter coveys—including large ones of 30 birds or more—in previously unoccupied farmyards and open fields one and one-half to two miles away from the streams. Among these coveys were some that were almost certainly wanderers, but the losses associated with winter-wandering of a few coveys in spacious central Iowa cornfields seem proportionally much less than those of birds drifting from one filled territory to another in areas having less food and more cover (Errington and Hamerstrom, 1936).

Since the Bob-white may nest in grassy prairie fence rows and roadsides miles from wintering quarters and as the preliminary splitting of paired birds from coveys may be observed as early as the middle of February, some of the movements into open habitat in late winter may conceivably be initiated by the approach of the breeding season. The evidence suggests, however, that the majority of the peripheral coveys gradually accustom themselves to living with less brushy cover than they require in late fall and early winter—a period of readjustment and more or less mortality from enemies.

In summer, the more general distribution of the birds, the poor visibility resulting from a profusion of ground cover, and the ephemeral persistence of carcasses are serious hindrances to the analysis of mortality in detail, and we have few reliable data on recovery of central Iowa Bob-white populations during the breeding season. Eleven years of data from an area of five square miles near Prairie du Sac, Wisconsin, indicate that the net increase of birds by late autumn and early winter is commonly in inverse ratio to the density of the spring population (Errington and Hamerstrom, 1936: 422; 1937: 17; Leopold and Errington, MS). In other words, environment that is well filled with adult birds is not likely to rear many young, with lower recovery rates under such circumstances being attributable as much as anything to accelerated juvenile mortality. Differences in kinds and numbers of enemies apparently have much more influence on seasonal recovery rates of Bob-white populations in southeastern than in north-central states (Stoddard, 1931; Komarek, 1937; Errington and Stoddard, 1938).

Irregular Fluctuations

Sudden losses from starvation may take place even during rather mild weather if the food of the birds is cut off by heavy snow or ice. Much of the 1934-35 early winter decline for the 4200-acre Squaw Creek area (Table 3) was thus accounted for, and a food crisis also followed experimental discontinuation of artificial feeding at Des Moines (Table 1) (Errington, 1936b: 560-562).

As a rule, but not invariably, northern Bob-whites can withstand cold as long as they are in good flesh (Errington, 1939: 23-7), and this

is illustrated by the Ames data for 1939-40. The extended "Indian summer" had permitted clean harvesting and pasturing by livestock of the corn field feeding grounds of a number of the Squaw Creek coveys; what little food remained was covered by snow from about the first of the year to midwinter, but few birds died of hunger before the middle of January; then, temperatures that dropped to 25° below zero (F.) eliminated in the space of less than 24 hours on January 17 and 18 almost all Bob-whites on the area not living near farm yards, feeding stations, or fields of soy beans. Our census figures show a decline of 51 birds between late December and January 20; the carcasses of 40 were found during, or just after, the cold snap. Of these carcasses, 14 collected before scavengers had eaten on them averaged 121.3 grams or from 60 per cent to 65 per cent of their "normal" winter weights, hence were in somewhat better flesh than the usual starvation victims dying at higher temperatures (Errington, 1939: 23-7). The decline of seven birds between December 28 and January 26 on the territory east of Skunk River (Table 2) mainly represents starvation losses suffered by a covey before it moved into a farm yard. Subsequent to the January, 1940, crisis, the Ames coveys wintered with slight detected mortality.

The exceedingly severe winter of 1935-36 was one of drastic losses in Iowa and southern Wisconsin (Green and Beed, 1936; Leopold, 1937; Leopold and Errington, MS), a great deal of which was due to hunger; but at least some of the lethal effect of this winter may be charged to exposure. Scott (1937) describes a covey of otherwise normal central Iowa birds reduced to helplessness by partial encasement of their heads in ice and snow. Of 14 southern Wisconsin Bob-whites found dead by Wade (1938) after the covey had been scattered just before, or during, a blizzard, five "weighed over 200 grams thawed, none less than 160 grams thawed" (Leopold, 1937: 411). The birds resident in 1935-36 on the Skunk River area (Table 2) were unusually well situated when observations were begun in the middle of January; whether these represent remnants of an earlier population is not known, but the population of the Squaw Creek territory (Table 3) really did not start dying before this time, and that of the Des Moines territory (Table 1) maintained its approximate numbers until the blizzard of February 8.

In 1939-40, a covey living about a half mile off the Squaw Creek observational area suffered another type of mortality. While on a field trip January 27, a graduate student, Mr. Leo Brown, dug five Bob-white carcasses out of a very hard snowdrift beside the snow fence of a railroad. Going out two days later, I found four more carcasses and "sign" corresponding to about four living birds. Seven intact carcasses were in good flesh, averaging 184.3 grams with no food in their stomachs. The birds had died in two loose groups (not in "huddle" forma-

tion) some days before and apparently from asphyxiation following individual imprisonment by drifting snow.

Winter losses from miscellaneous causes may vary. Shooting or trapping, which may have a pronounced effect on Bob-white population levels in some communities, is not thought to have been of consequence on the central Iowa areas during the years of the investigations. Young hatched in September or October may be at a hopeless disadvantage if cold, stormy weather comes early; some full-sized birds appear hypersensitive to low temperatures and are eliminated by the first sub-zero cold. Injuries and diseases claim individuals from time to time. Security from predation is rarely absolute, and even well situated populations may lose a few birds to enemies in the course of the winter —especially in the early part.

During the warmer months much happens concerning which we can expect to gain only fragments of information. We know broadly that the reproductive success of local Bob-white populations may be affected by climatic vicissitudes or by agricultural practices such as burning, mowing, and pasturing, and that losses of mating and incubating adults, of nests and young, may be heavy or light, but, for all of that, intercompensatory trends in breeding and loss rates may counteract many of the influences that would seem conducive to irregularities in population maintenance (see Errington and Hamerstrom, 1937, for related data and discussion).

The Question of Periodicity

Through intensive field work, we have been able to trace the preponderance of the central Iowa winter losses that we had any reason to believe due to actual death of the birds, and these losses fell with some consistency into well known and characteristically irregular types. It would therefore seem that, if any truly "cyclic" decline of central Iowa Bob-whites took place between 1932 and 1940, the causative factors must have been dominantly operative at another time of year. Kendeigh's (1933) compilation of the *Bird Lore* Christmas bird censuses for Ohio, 1908-31, show the effects of certain killing winters, but not all of the declines may be so correlated.

Failure of breeding stock to repopulate specific areas at expected rates may, for one thing, be associated with drought. In 1934, there seemed to be a rough agreement between autumn Bob-white scarcity over much of southern Iowa and the length and intensity of the spring and summer dry period in different localities (Errington, 1935); a less pronounced decrease was indicated by data from the central Iowa areas; at Prairie du Sac, Wisconsin, the recovery was "normal" for the breeding population. In view of the fact that the "cyclic" decline of grouse and rabbits in Minnesota and Wisconsin was contemporaneously in progress, the possibility of the Bob-white likewise showing general and "cyclic", rather than local and irregular, fluctua-

tions was considered but without any conviction that the Iowa declines could not be attributed mainly to the unfavorable season.

That a rainy summer may adversely affect Bob-whites is known (Stoddard, 1931: 200-202), and the unusually wet summer of 1935 was at least accompanied by rates of recovery from central Iowa breeding stock that were below expectations. Nevertheless, it is unproved that, in this case, the relationships of recovery rates to the weather were more than incidental. Recovery was "normal" for the spring density of birds at Prairie du Sac.

Winter-killing in 1935-36 had reduced breeding populations throughout the region (Green and Beed, 1936; Leopold, 1937), but neither this nor the 1936 drought, nor the two in combination, may be advanced as full explanation for the near-disappearance of Bob-whites in the vicinity of Ames. The Prairie du Sac recovery was only about half "normal" for the season's adult population—which, considering the regularity that percentages of increase on the area rose and fell inversely with the breeding densities during other years, droughts and winter emergencies notwithstanding, may suggest a depressive mechanism somewhat different from any we have hitherto succeeded in analyzing. The very poor 1936 recoveries of many species of upland small game living in the north-central region, including "cyclic" grouse and rabbits, may or may not have a significant correlation; but the data available do not refute the concept that irregular fluctuations of the Bob-white may perhaps be superimposed upon a basically, if not conspicuously, "cyclic" pattern. The similarity in the low points of the Ohio Bob-white curve (Kendeigh, 1933) and those of the hardy but violently "cyclic" Ruffed Grouse (*Bonasa umbellus*) of Wisconsin (Leopold, 1931: 142), for example, may not be due to chance.

From 1937 to 1939, Bob-white population recoveries in central Iowa and southern Wisconsin showed increasingly predictable trends, irrespective of further droughts and winter mortality, and little appeared to happen that could not be accounted for in terms of past experience.

The Competitive Status of the Ring-necked Pheasant

The Ring-necked Pheasant is not the least formidable of the exotic game birds the introduction of which has been a source of apprehension to many conservationists, and its combative prowess may even be manifested by vicious encounters with poultry cocks in farm yards or by beating off attacking enemies such as dogs or hawks. It is not strange that the occasionally authentic reports of Pheasants destroying eggs or young of ground-nesting birds should lead to conjecture as to whether some of our native wild species may thereby be driven out.

So far as the Bob-white is concerned, the aggressive traits of the Pheasant appear to be of slight direct importance. Regardless of interspecific friction that may now and then take place, Pheasants and Bob-

whites may frequently be seen using the same feeding stations and otherwise consorting without evidence of animosity. On the other hand, some types of competition between Pheasants and Bob-whites may have an adverse influence upon population levels of the latter.

The superior foraging ability of the Pheasants give them a distinct advantage over Bob-whites in such food competition as may exist between the two species (Errington, 1939). Lethal aspects of food competition during crises, however, have been observed less often than benefits to the Bob-white resulting from Pheasants—along with Crows (*Corvus brachyrhynchos*), rabbits, and fox squirrels (*Sciurus niger rufiventer*)—exposing ice-glazed or snow-buried corn and otherwise rather inaccessible foods. Dependence of Bob-whites upon "competitors" for food was especially noted on the Squaw Creek area (Table 3) during 1934-35 (Errington, 1936b: 559) and 1935-36 (Errington, 1939:34).

Competition for wintering environment on semi-wooded farm lands of southern Iowa and southern Wisconsin may favor Bob-whites rather than Pheasants insofar as the former may be better adjusted to particular habitats. From central Iowa north and west to southern Minnesota and eastern South Dakota, the prairie farm lands not only have fewer brushy coverts suitable for Bob-whites but fewer still that are not also attractive to the far more abundant Pheasants. It has been noted that, while Bob-whites may tolerate low or moderate densities of Pheasants, they tend to avoid coverts where Pheasants concentrate, essentially as they do those overpopulated with their own species. The Pheasants themselves may be tolerant of massing within much greater limits, as in fall and winter it is sometimes possible to flush hundreds at once from certain parts of tree claims, marshes, and corn fields.

The difficulties of getting reliable census figures on birds that may range as widely and irregularly as Pheasants have restricted our opportunities for even reasonably exact studies. It is neither easy to say what constitutes a sufficient number of Pheasants to cause Bob-whites to leave their coverts, nor to what degree such abandonment may have lethal consequences.

A 200-acre experimental area of the University of Wisconsin had a mixed wintering population of 47 Bob-whites and about 30 Pheasants in 1930-31 and a population of 26 Bob-whites and about 50 Pheasants in 1931-32, or a total close to 77 and 76 gallinaceous birds for two successive and comparable winters (Errington and Hamerstrom, 1936: 335, 368-369, 429-431). The carrying capacity of the tract for Bob-whites apparently declined as the Pheasant population rose; in 1931-32, a concentration of about 40 Pheasants in a 5-acre woodlot was followed by a definite withdrawal of the Bob-whites. The Bob-whites of a game management area near Ida Grove, Iowa, 1932-33, avoided the most attractive covert after about 35 Pheasants established themselves there;

and similar observations were made on neighboring land. The Story City data presented in Table 4 show a survival of 31 Bob-whites and a wintering population of about 8 Pheasants for 1934-35; 15 Bob-whites and about 27 Pheasants for 1939-40; or mixed wintering populations of about 39 and 42 birds for the two winters that are eligible for comparison.

Pheasants were present but very scarce on the Des Moines area, three being the largest number recorded for the 300-acre sample on any visit between 1932-33 and 1939-40. On the Ames areas, after several years of not doing much more than maintaining themselves at low densities, the Pheasants practically doubled their wintering populations between 1938-39 and 1939-40 (Table 4); as usual, the Bob-whites sooner or later departed from coverts frequented by more than about a dozen Pheasants, but the heaviest Bob-white survival in years does not indicate that the 1939-40 Pheasant population was seriously competitive.

TABLE 4

COMPARATIVE WINTERING DENSITIES OF BOB-WHITES AND RING-NECKED PHEASANTS NEAR AMES AND STORY CITY, IOWA, 1932-40

Area	Winter	Bob-white populations		Figures arrived at for mid-winter populations of Pheasants—see text for comments
		Early winter	Late winter	
1000 acres southeast of Ames	1932–33	129	105	8 to 12
	1933–34	133	58	
	1934–35	58	9	
	1935–36	44	40	probably close to 25
	1936–37	about 10 all winter		8 to 12
	1937–38	12	9	perhaps 20
	1938–39	40 to 50 all winter		
	1939–40	115	92	35
4200 acres north and northwest of Ames	1934–35	156	57	12 to 15
	1935–36	data incomplete		about 25 to 30, with possibly a gradual increase from 1935–36 to 1938–39
	1936–37	19	15	
	1937–38	about 12 all winter		
	1938–39	45	39	
	1939–40	231	170	64
640 acres Story City	1934–35	23	31	8
	1935–39	data incomplete or of poor quality		
	1939–40	18	15	27

How abundant the Ames Pheasants would need to become to depress winter Bob-white populations and how likely the Pheasants are to increase up to this point are questions for which we as yet have no answers. Old notes indicate that, by the fall of 1921, Pheasants were just becoming established on my family's 300-acre farm west of Bruce, South Dakota, and that they reached peak numbers of about 350 by

the fall of 1927—a rise from an estimated 5 to 10 birds, or several thousand per cent in six years. This South Dakota farm presumably furnished better environment for Pheasants than exists on the Ames Bob-white areas, but Conservation Officers and other observers have also reported pronounced recent increases of Pheasants in many central and southern Iowa counties that were formerly sparsely occupied despite continued stocking. In the event that the present ascendencies of Pheasants terminate in populations averaging a bird per 2 to 10 acres over wide areas—which appear to be densities about as high as we may expect to find in midwestern "pheasant country"—a material lowering of the capacity for accommodation of Bob-white habitats may be entirely conceivable.

But even when Pheasants have all of the advantage of numbers, adaptations, and habitats, and their dominance adversely affects Bob-white population levels, it does not necessarily follow that the Bob-white will as a species be evicted from a given locality. It is still possible to find Bob-whites nearly every year in some of the strongest Pheasant range of glaciated north-central United States; data from the vicinity of Ruthven and Emmetsburg, Iowa, Hutchinson, Minnesota, and Lake Norden, South Dakota, refer to aggregates of two or three coveys of Bob-whites living along the edges of dry marshes frequented by hundreds if not thousands of Pheasants.

In the above instances, there were two apparent major reasons why competitive interactions between a thriving and another greatly handicapped species did not lead to complete replacement of one by the other, after the manner shown by the experiments of Gause *et al* with simple microcosms (Gause, 1935; Gause and Witt, 1935). The Pheasants seldom occupied with any uniformity the whole of the environment suited to Bob-whites but tended to mass along certain sides of a marsh, for example, thus leaving at nearly any time a few more or less vacant places to which Bob-whites could withdraw in comparative privacy. Then, again, the latter birds were not strictly confined to brushy habitats but were able to live more in weed patches, marshy growths, and corn fields, much as were those of the Ames coveys that displayed unusual mobility and latitude in choice of coverts.

Discussion

The statement by Stoddard (1931: 170) that Bob-white coveys tend to keep their organization of normal size through repeated combinations is emphasized by data on the possible role of "tradition" in determining toleration limits in wintering territories.

On the whole, the coverts that are occupied the most continuously seem to show the greatest year to year constancy of carrying capacity, for example, those of the main territory at Des Moines (Table 1).

The population figures for the Skunk River territories, as they are presented in Table 2, look highly variable in many respects, but the one part of the west territory that was frequented nearly every winter usually accommodated between 8 and 10 birds; the east territory, either abandoned or not occupied for five successive winters, revealed little uniformity in population levels at times when it did have birds. Three of the seven habitable Prairie du Sac, Wisconsin, territories or groups of territories that showed such definiteness of carrying capacity, 1929-35 (see Errington and Hamerstrom, 1936: 368-369, 394-395), still seem able to accommodate about the same number of birds, and these are the only ones that have not been grossly underpopulated for more than one winter in succession since 1935-36; in the course of 11 years of study, two apparent changes in carrying capacity—from one rather definite value to another—were noted, both changes following two-winter vacancies (unpublished).

The sole evidence that appears against this concept is that furnished by the Squaw Creek territory, which after four winters of underpopulation (not including 1934-35, when the territory was well filled by early December) accommodated in 1939-40 a population that compares with what were judged to be carrying capacity figures in 1932-33 and 1933-34. Six other possible territorial blocks of the 4200-acre Squaw Creek area had quite dissimilar populations in 1934-35 and 1939-40; these two seasons, with at least three low-population winters intervening, are the only ones for which our data indicate full or nearly full coverts. The existence away from the streams and gullies of large acreages of prospective or semi-habitable environment—highly attractive from the standpoint of food—is itself a partial explanation for much of the territorial laxity observed in central Iowa, but some of the differences might simply be due to failure of local habits to be carried over.

The likeliest mechanism behind these toleration phenomena seems to be dominance by veteran individuals that have their own ideas as to what constitutes desirable or safe numbers of birds in specific habitats. As long as the habitats are fairly well filled each winter, there should be a greater chance of "traditions" being retained, either through continued presence of dominant old birds or through successors having had previous local experience. It may be postulated that "traditions" die along with populations during periods of great mortality or fail to be maintained during a series of low-density years when extensive areas are left unoccupied. Interchange of Bob-whites between neighboring coveys and reorientation of old and young in different local covey groups has been demonstrated by banding (Stoddard, 1931: 169-182; Errington, 1933) as well as indicated by field observations; and it is probable that coverts well occupied for a succession of winters generally have a number of birds the responses of which to crowding in

particular places may be conditioned by former "apprenticeship" there. Emlen (1939: 125; 1940: 94-95) carried on a very detailed banding and feather-marking study of California Valley Quail populations and found that older birds had a distinct advantage in competition with the immature and the yearlings; however, he writes (letter, July 14, 1940) that there is "very little evidence of policing activity or of peck order in . . . coveys until February when, it is true, older birds generally rank highest (except when these are recent immigrants or transplants from other coveys) . . ." It is therefore conceivable that "traditions" may not represent the reactions only of veterans and that "apprenticeship" may be of shorter duration.

The possible applications of the work by Lorenz (1935; 1937) on the critical effects of early experiences of various young birds are worth considering. In the above correspondence, Emlen raises the question whether "imprinting" ("Prägung" of Lorenz) resulting from association of Valley Quail chicks with different sizes of broods or combined broods may not have a bearing upon their later flocking habits. To explain constancy of carrying capacity or of toleration limits for the Bob-white, I would think that such "imprinting" would have to be operative fairly late in life, for constancy not only seems to be maintained despite variations in size of broods and fluctuations in juvenile mortality accompanying low or heavy densities of adults but also despite the fall reorientation of the birds and occasional great changes in year-to-year food and cover relationships.

The influence of quality and distribution of food and cover on habitability of wintering environment need not be minimized in our efforts to understand Bob-white populations. We should recognize, nevertheless, that carrying capacity of given land units may be to a considerable extent a matter of what the birds themselves make it.

Summary

An eight year (1932-40) field study of central Iowa Bob-white populations not only began and ended with abundance peaks but also covered an interval of pronounced scarcity. Practically all of the traceable mortality associated with the decline took place during the winters of 1934-35 and 1935-36 and most of this proved to be of the familiar starvation-emergency types that may be expected on a greater or less scale nearly any winter; an inexplicably low rate of recovery of Bob-whites among other wild species during the breeding season of 1936, however, may suggest the operation of unknown factors, perhaps of periodic nature. Occupancy of given tracts of environment is evidently determined by the sociality of the birds as well as by food and cover conditions; and this is illustrated by Bob-white responses to crowding either on the part of their own or some other species as the Ring-

necked Pheasant, by their occasional late-winter adaptiveness in establishing themselves in food-rich fields away from the bushy fence rows, woodlots, gullies, and water courses usually frequented, and by their apparent maintenance—despite annual changes in habitats and in covey composition—of toleration "traditions" peculiar to the most regularly used winter territories.

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THE CROW AND THE RAVEN IN EARLY WISCONSIN

By A. W. Schorger

THE early writers on Wisconsin birds state that the Crow† was a comparatively rare bird while the Raven‡ was common. Settlement of the state produced a complete reversal, the Crow becoming very abundant and the Raven disappearing from the southern portion. While it is true that the Crow is seldom mentioned in the early accounts, this statement applies with almost equal force to the Raven. Both species have received only casual mention and the earliest records are easily overlooked.

Errors occur in the translations of the *Jesuit Relations* and other early French writings where *corbeau* appears indiscriminately as either Raven or Crow. In every case examined the French is *corbeau*. This criticism applies also to place names, such as Crow Wing River (*Aile de Corbeau*). The only instance noted where Crow (*corneille*) was properly applied is mentioned by Schoolcraft[1] who was in Minnesota in 1820. A small stream called *Corneille* by the French flows into the Mississippi between Saint Anthony Falls and Crow Wing River.

The Crow was long known to the northern Indians. Schoolcraft mentions that the Chippewa name is *andaig*. W. W. Cooke[2], who spent three years among the Chippewas at White Earth, Minnesota, states that the Raven is called *ka-gog-i'* and the Crow *an-deg'*, meaning those that migrate, in contradistinction to the Raven which is a permanent resident. Schoolcraft[3], in spite of his vigilance, is inconsistent. He makes the interesting observation that the Magpie occurs at Lac du Flambeau, Wisconsin, and translates the Chippewa name, *wabish kagagee*, as White Crow.

Perhaps the first mention of the Raven in Wisconsin is made by Perrot[4]. He visited the Mascoutin Indians at the site of modern Berlin, Wisconsin, in 1666, and relates that at a feast some Indians had the skins of Ravens with their feathers (*peaux de Corbeaux avec leur plumage*) attached to their girdles. Hennepin[5], while coasting along the Wisconsin shore of Lake Michigan in October 1679, found a deer upon which Ravens and eagles were feeding. In keeping with tradition, the Raven is mentioned in connection with disaster. Marin[6] in a letter dated May 11, 1730, describes his attack on the Fox Indians in their fort on Lake Winnebago. After the fifth day of battle, Ravens were seen to alight in the fort from which it was concluded that the enemy had departed. Rev. Cutting Marsh[7] recorded in his journal on September 18, 1834, that one of the Stockbridge Indians had found at South Kaukauna a dead body marred beyond recognition by Ravens.

† *Corvus brachyrhynchos.*
‡ *Corvus corax.*

The Crow is not mentioned until well into the nineteeth century. The evidence for its presence and abundance is conflicting over a period of many years. This may be due to erratic distribution or to faulty observation. As late as 1905 Sayre[8] wrote: "Forty years ago one never saw a crow in Wisconsin, and yet within but a year the supervisors of Rock County passed an ordinance to pay ten cents for each crow killed." Nevertheless, the Crow did occur throughout Wisconsin before the agriculture of the whites.

The Crow, according to Richardson and Swainson[9], ranged to the fifty-fifth parallel of latitude as early as 1831. Schoolcraft[10] found both the "Crow (*Corvus corone L.*)" and "Raven (*Corvus corax L.*)" in Minnesota in 1820. McKenney[14] was on Madeline Island, Wisconsin, in late July, 1826, and wrote: "Tame crows appear common in this part of the world. I notice four here that fly after the family as if they were part of it and had never been wild." Crows were not confused with Ravens, for he mentions having seen the latter at the mouth of the Montreal River.

In 1823, Keating's[21] party* travelled overland from Chicago to Prairie du Chien. "The Crow (*C. corone*)" was not encountered until the Wisconsin River was reached. This was the first heavily wooded area encountered, the significance of which will appear later. Mrs. Roseline Peck[13], the first white woman to settle at Madison, mentions that in July 1837, some of her guests "shot my two little pet crows." This act is to be commended highly, as it is improbable otherwise that these Crows would have become historic. McLeod[14] travelled through southern Wisconsin in the '40s and among the birds of the region mentions both the Crow and the Raven.

The contribution of Moses Barrett[15] is particularly interesting, with respect to distribution. In the fall of 1850 he settled on the "Indian Lands" at Wautoma, then on the edge of the wilderness. Flocks of eight to ten Ravens were seen in winter and the species remained for two or three succeeding seasons. During this period numerous settlements were made and the Raven disappeared. A year or so later the first Crow arrived, soon followed by others. Barrett was of the opinion that the Fox River formed the boundary between the two species and that they would not intermingle. J. A. Allen[16] immediately replied with the statement that in Dakota and Montana he found Crows and Ravens intermingling freely and even breeding in the same forests. On Madeline Island where Crows congregate by hundreds in autumn I have failed to observe any antagonism between the two species.

References become more numerous and scientific after 1850. Barry[17], in his list of the birds of Wisconsin, states that the Raven is rare while

* This is known as Long's Second Expedition to which Thomas Say was attached as naturalist. Say was the first trained zoologist to travel in Wisconsin. He left but little information on the birds of the state due in part to the loss of many of his specimens in transit. I have been unable to trace any of his notebooks for this period.

only a few Crows have ever been seen in the state. Hoy[18] considered the Crow one of the rarest birds at Racine and records that "it never takes up its quarters within fifteen or twenty miles of Lake Michigan." The Raven was more numerous, and resident. In a later paper Hoy[19] states that the Crow was first seen by him at Racine in 1858 and that they began to nest in that section "about twenty years since," which would be about 1865. The Raven became scarce about 1850. R. M. Strong[20], writing in 1895, stated that thirty years earlier the Crow was considered by the old settlers to be a comparatively rare bird.

The curious conflict of opinion continues. Kennicott[21] reported the Crow and Raven as common throughout the state of Illinois and stated that both species have been known to nest in Cook County. About twenty years later (1876) E. W. Nelson[22] wrote that the Crow "is far from an abundant species in Northern Illinois, at any season or locality."

The report of King[23] on Wisconsin birds was based on field work done from 1873-7. He states that the Crow is common throughout the southern portion of the state and winters in considerable numbers. At that time the Crow was known to occur in the Mississippi valley as far north as New Richmond, Saint Croix County, but he had not observed it in the eastern portion of the state north of Stevens Point. However, at about this time Willard[24] reported the Crow as breeding near Green Bay while at the same time (1881-83) Grundtvig[25] found it common in migration, with a few nesting, in Outagamie County.

Reports on the wintering of Crows in the northern half of the state do not appear until about 1870. The statement of Kumlien and Hollister[26], made in 1903, that Crows do not winter in north and north-central Wisconsin requires modification. In the winter of 1872-3 they remained in unusual numbers at Prescott[27], as well as at New Richmond[28] in the winters of 1872-3 and 1875-6. In the winter of 1883-4 they remained in Fond du Lac County.[29]

The small population of Crows in southern Wisconsin in the early days was due in large part to the presence of great areas of prairie. Elliott Coues[30] mentions that the Raven ranged more over the plains, while the Crow was "partial to the wooded river-bottoms, and the immediate vicinity of the water-courses." There is general agreement that the Crow, in both Wisconsin and Illinois, was a comparatively rare bird in the prairie regions until the latter were brought under cultivation. Agriculture not only provided more food but permitted the growth of forests previously prohibited by prairie fires.

It may be stated in general that the Crow was distributed sparsely in the state prior to 1855, became common in the southern portion by 1875, and abundant by 1890. The Raven began to disappear from the southern half of the state about 1850 and became a scarce winter visitor about 1865. Its rarity in extreme southern Wisconsin may be

judged by the fact that the last record known to Kumlien and Hollister[26] was the one shot at Lake Koshkonong in November 1891. In October, 1934, one was shot by duck hunters at Crystal Lake, Dane County, and subsequently recovered by Leonard Wing.[31] At the present time the species is confined largely to the northern third of the state.

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INCUBATION STUDIES OF THE YELLOW-HEADED BLACKBIRD [1]

BY REED W. FAUTIN

ALTHOUGH the Yellow-headed Blackbird, *Xanthocephalus xanthocephalus* (Bonaparte), is a fairly common bird within its breeding range, the details of its incubating activities have been given but little attention, even though its nesting habits afford several advantages for making a study of this kind. This species nests in colonies of considerable size, thereby making it easy for the investigator to keep a large number of nests under observation within a comparatively small area, to obtain incubation data on a large number of eggs, and to make observations on the incubating activities of many individual birds.

During the spring and summer of 1937 two colonies of "Yellowheads" were kept under observation from April until September. The larger of the two colonies, occupying an area 5 acres in extent, was situated at the mouth of the Provo River on the east shore of Utah Lake and will be referred to as the "Provo River colony." The height and density of the vegetation, *Tamarix gallica* and *Salix* sp., made the determination of the exact number of males present very difficult, their maximum number being estimated to be 35 at the height of the nesting season. Eighty-three females nested in this colony, thus making a maximum population of 118 birds.

The smaller colony, consisting of 40 females and 12 males, was located northeast of the Provo River colony about two miles east of Utah Lake and will be referred to as the "Lakeview colony." This colony was confined to a small bulrush marsh, 0.37 acre in size, situated in a low depression surrounded by higher ground and open pastures. The entire area occupied by this colony could be observed from any one position around its border, thus making it convenient to observe the behavior of individual birds and to check on the exact number of birds in the colony. Observations on the behavior of the incubating females were restricted to birds of the Lakeview colony because of the location as described above.

Most of the nests were located during the time of their construction and the progress of each nest was followed until the young birds had left. Each nest was given a number when it was first located, a parchment tag with the number being attached to the vegetation near the nest. The location of each nest in the Lakeview colony was marked by sticking a tall willow into the mud within a few feet of the nest. The presence of these tall willows, in contrast to the shorter bulrushes, made

[1] Contribution from the Zoological Laboratory of the University of Illinois, No. 581; and No. 85 from the Department of Entomology and Zoology, Brigham Young University, Provo, Utah.

it very easy to locate and identify the various nests in the colony at a distance.

During the early part of the season, the nests were visited daily but as more nests were located and more time was consumed in visiting nests, weighing young, and observing individual birds, it became necessary to visit each of the colonies on alternate days. The eggs were marked with India ink to facilitate identification at the time of hatching.

Egg-laying

The laying of eggs began within one to 7 days after the nests were completed. Sixty-one and eight-tenths per cent of the females laid their first egg the first day after their nests were completed; 23.7 per cent the second day; 10.5 per cent the third day; and 4 per cent the fourth day.

The deposition of eggs began about the same time in both colonies, the first egg being recorded May 7 in the Provo River colony and the first one May 8 in the Lakeview colony. The period between the first and last eggs laid was approximately 7 weeks, the last egg recorded in the Provo River colony being laid June 10 and the last one in the Lakeview colony June 22.

The number of eggs present varied from 2 to 5, with 4 the most common number (Table 1). One egg was laid each day until the clutch was completed. Most of the eggs laid during the fore part of the season were 4-egg sets, but as the season progressed there was a tendency for more sets of 3 to be laid. The 2-egg sets were the result of second attempts at nesting by females whose first clutch had previously been destroyed.

TABLE 1

Nesting Statistics

	Provo River colony		Lakeview colony	
	No.	Per Cent	No.	Per Cent
Nests recorded	84	100.0	44	100.0
Nests completed	82	97.7	42	93.2
Incomplete sets of eggs	3	3.7	3	7.1
Total completed sets of eggs	79	96.3	39	92.9
a. Two-egg sets	1	1.3	3	7.7
b. Three-egg sets	16	20.2	10	25.6
c. Four-egg sets	59	74.7	24	6.15
d. Five-egg sets	3	3.8	2	5.2
Average number of eggs per set	3.8		3.6	
Total number of eggs laid	301		142	
Number of young hatched	228	75.7	86	60.6
Eggs failing to hatch	73	24.3	56	39.4
a. Infertile or addled	29	9.7	10	7.0
b. Destroyed before hatching	44	14.6	46	32.4

Beginning and Duration of the Incubation Period

The beginning of incubation varied from the time the first until the third egg was laid, but in most cases began with the deposition of the second egg (Table 2).

In some clutches each of the eggs hatched consecutively on the thirteenth day after they were laid, indicating that incubation had begun at the time the first egg was deposited and that the length of the incubation period in such instances was 12 days. The eggs of other clutches hatched consecutively in the order in which they were laid on the fourteenth day after being deposited, indicating that incubation

Figure 1. Nesting area of the Lakeview colony.

was begun in such clutches at the time the first egg was laid and that their incubation period was 13 days in length.

In those clutches where 2 eggs hatched the first day and each of the remaining ones on consecutive days, incubation was considered to have begun at the time the second egg was laid. When incubation began at the time the third egg was laid the first three eggs deposited all hatched the same day.

Although there was a definite tendency for all the eggs of the same clutch to require the same length of time for incubation, yet there were a few exceptions in which the eggs did not hatch with such regularity. In one particular set the first 2 eggs laid hatched after 12 days of incubation in the order in which they had been laid, but the third egg did not hatch until 2 days after the second, making its incubation

period 13 days in length. This delay may have been due to a sudden drop in the temperature of the air caused by a cold rain accompanied by wind during the twelfth day of incubation of this particular egg. This storm was not responsible, however, for another type of variation in which 2 eggs would hatch the second day after hatching began instead of the first. If incubation began at the time the first egg was deposited, in such cases, then, two of the eggs would have an incubation period of 13 days duration and the other two 12 days. If, on the other hand, incubation began at the time the second egg was laid, 3 of the eggs would have an incubation period of 12 days and the other one 13 days. Such irregularities occurred in only a very few nests and may have been due to differences in the degree of attentiveness of different females or of the same female at critical times during the incubation period, or possibly to the eggs not receiving identical incubation conditions in the nest.

From Table 2 it can be seen that incubation began before any of the clutches were completed and that there was a tendency for it to begin sooner, with respect to the time the eggs were laid, the smaller the clutches were, being delayed until the third egg was laid in only the 4- and 5-egg sets. Incubation began at the time the first eggs were deposited in all 2-egg sets.

In Table 3 are given detailed data concerning the length of the incubation periods for the different sized sets of eggs in each colony. These data include only sets in which all the eggs in the same set had the same incubation periods and indicate that there is no correlation between the size of the sets and the length of the incubation periods. In both colonies the majority of the sets had a 12-day incubation period, but the 2-egg sets were the only ones in which the incubation period was restricted to 12 days. When the data for all sets are combined it is found that 74.6 per cent of the eggs had a 12-day incubation period and 25.4 per cent of them a 13-day period.

There was a tendency for fewer of the eggs which hatched later in the season (June) to have a 12-day incubation period than those which hatched earlier (May). In the Provo River colony 86 per cent of the eggs which hatched in May had an incubation period of 12 days, whereas only 58.5 per cent of those which hatched in June hatched in 12 days. This phenomenon also occurred in the Lakeview colony in which 89.9 per cent of the eggs that hatched in May required only 12 days for incubation while only 51.4 per cent of those in June hatched in 12 days. The difference in the mean monthly temperatures for May and June would apparently be of little significance since it amounted to only 2.6° F. As has been shown by some investigations (the Oven-bird, Hann, 1937; Song Sparrow, Nice, 1937), there seems to be no correlation between the length of the incubation period, within the normal range for the species, and the time of year that incubation occurs.

TABLE 2
TIME OF BEGINNING INCUBATION

Size of set	3 Eggs				4 Eggs						5 Eggs			
Beginning of incubation	1st Egg		2nd Egg		1st Egg		2nd Egg		3rd Egg		2nd Egg		3rd Egg	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Provo River	4	66.7	2	33.3	15	33.3	25	55.6	5	11.1	2	100	0	0
Lakeview	1	50.0	1	50.0	4	23.5	12	70.6	1	5.9	1	50	1	50.0
Total	5	62.5	3	37.5	19	30.6	37	59.7	6	9.7	3	75	1	25.0

Beginning of incubation in all sets	First Egg		Second Egg		Third Egg	
	No.	Per Cent	No.	Per Cent	No.	Per Cent
	24	32.3	43	58.1	7	9.6

TABLE 3
LENGTH OF INCUBATION PERIODS

Size of sets	2-egg		3-egg				4-egg				5-egg			
Length of period	12 day		12 day		13 day		12 day		13 day		12 day		13 day	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Provo River colony														
Sets of eggs	1	100	4	66.7	2	33.3	30	76.9	9	23.1	2	66.7	1	33.3
Lakeview colony														
Sets of eggs	1	100	1	50.0	1	50.0	13	72.2	5	27.8	1	100	0	0
Both colonies	2	100	5	62.5	3	37.5	43	75.4	14	24.6	3	75.0	1	25.0

However with the European Wren (*Troglodytes t. troglodytes*) Kluijver et. al. (1940) found that the average incubation period in April lasted 17.5 days, in May 16.3 days, in June 15.3 and July 14.5. Although there is no obvious reason why a higher percentage of the eggs hatched in May should have a 12-day incubation period than those which hatched in June, it is possible that this is the result of the incubation rhythm and attentiveness of the females being more constant and regular during the earlier part of the nesting season.

Attentiveness and Inattentiveness

The females were found to do all the incubating of the eggs, not assisted by the males in any way. This seems to be characteristic of many members of the Icteridae, occurring in the Red-wings (Allen, 1914); the Tri-colored Blackbird (Lack and Emlen, 1939); the Boat-tailed Grackle (McIlhenny, 1937); and the Eastern Meadowlark, (Saunders, in letter), Bobolinks, and orioles.

In many of the Icteridae sexual dimorphism in regard to size is very marked, especially in such birds as the Boat-tailed Grackle and the Yellow-headed Blackbird. This larger size of the males may be an important factor in preventing them from occupying nests constructed by the smaller females and consequently only large enough to accommodate themselves. Polygamy may also play a part in discouraging the males from attempting to aid their several female mates with incubating activities.

During the incubation period the females divided their time between alternating attentive periods (on) and inattentive periods (off) the nest. The length of these periods was determined by observing individual females from a blind, timing them as they left and came back to the nest. These periods were found to vary in length with different females and with the same female during different parts of the day and during different parts of the incubation period. Unfortunately hourly temperatures were not recorded during the periods of observation and consequently no information can be presented relative to the possible effects of temperature changes on the length of the attentive and inattentive period. Daily mean temperatures were recorded but there seems to be no correlation between them and the nesting rhythm of the birds concerned. With Song Sparrows (Nice, 1937) and Oven-birds (Hann, 1937) it was found that the cooler the weather, the shorter the inattentive periods.

The periods of inattentiveness were more uniform in length than were the periods of attentiveness, having a range of one to 18 minutes, whereas the periods of attentiveness ranged from one to 41 minutes in length. The average length of the attentive periods for all females observed was 9.1 minutes, whereas the average length of the inattentive

periods was 5.4 minutes. During more than 80 hours of observation the females spent an average 63.9 per cent of their time on their nests and 36.1 per cent off (Table 4).

TABLE 4

INATTENTIVENESS

Nest No.	Stage of incubation	Time of observation	Mean temp.	Periods per hour	Aver. length (minutes)	Range (minutes)	Per cent of time off nest
39	4th day	6:30 a.m.–6:36 p.m.	57.8	3.3	6.4	2–18	34.5
43	4th day	10:09 a.m.–7:00 p.m.	58.0	3.6	5.8	2–9	31.5
43	8th day	4:42 a.m.–8:00 p.m.	68.0	3.3	6.0	2–12	32.4
35	8th day	9:23 a.m.–6:22 p.m.	55.5	3.8	5.8	2–11	39.9
41	10th day	2:52 p.m.–8:00 p.m.	60.5	4.3	6.5	1–13	46.9
42	11th day	3:09 p.m.–8:00 p.m.	60.0	5.0	5.3	2–15	39.8
42	12th day	5:47 a.m.–8:00 p.m.	71.5	5.2	3.8	1–9	31.0
41	12th day	5:45 a.m.–7:52 p.m.	70.0	5.5	3.5	1–16	33.0
Grand Average				4.3	5.4		36.1

The amount of time spent on the nest varies in different passerine species as well as in the same species during different times of the day. When the percentage of time spent on the nest by the Yellow-headed Blackbird is compared with recent studies of several other species (Table 5), it is found that it is rather low, the Song Thrush being the only bird with a lower percentage of attentiveness.

TABLE 5

PER CENT OF TIME SPENT ON NEST BY VARIOUS PASSERINE SPECIES

Species	Reference	Period of observation	Average per cent of time on nest
Song Thrush (*Turdus philomelus*)	Bussman (1933)	7 hours, 40 min.	58.7
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	Fautin	83 hours, 23 min.	63.9
Hedge Sparrow (*Prunella m. modularis*)	Steinfatt (1938)	2 all day periods	66.4
European Nuthatch (*Sitta europea homeyeri*)	Steinfatt (1938)	11 hours, 17 min.	73.0
Song Sparrow (*Melospiza melodia*)	Nice (1937)	92 hours	76.5
Chiffchaff (*Phylloscopus collybita*)	Steinfatt (1938)	33 hours	77.5
Oven-bird (*Seiurus aurocapillus*)	Hann (1939)	4 all day periods	82.5
Marsh Tit (*Parus p. palustris*)	Steinfatt (1938)	12 hours	84.0

At the time the eggs began to hatch the females become more nervous and there was a tendency for the range in both the attentive and inattentive periods to become greater (Figure 2). Because of this difference in the behavior of the females before and at the time hatching began, the data concerning the length of the periods of attentiveness and inattentiveness during these two stages of the incubation period are considered separately. The average length of the periods of attentiveness was greatest at the beginning of the day followed by a gradual decrease during the morning hours, which seems to be correlated with the feeding activities, until about 11:00 A.M., when the length of the periods begin to increase again until about 2:00 P.M., after which time they again decrease in duration reaching a second low point about 5:00 P.M. when the females were again doing most of their feeding (Figure 2). Although the females did some feeding throughout the day, feeding

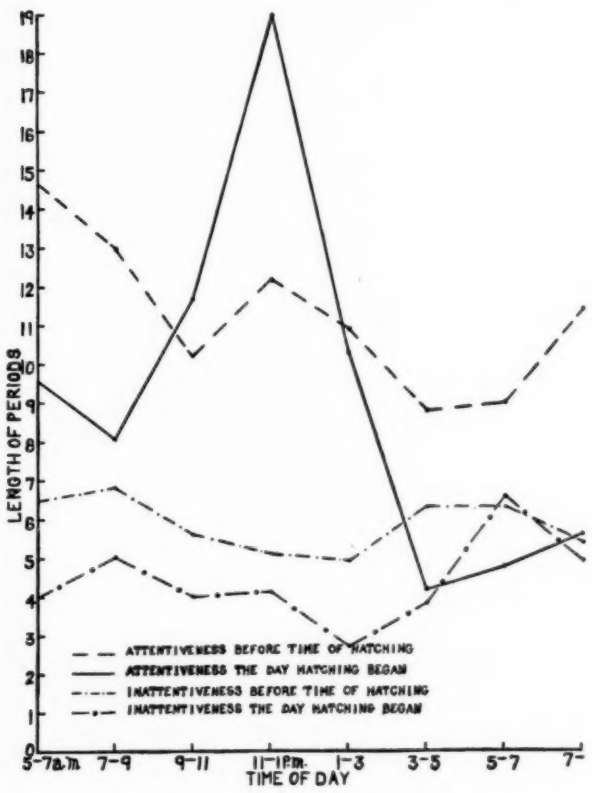

FIGURE 2. Average length in minutes of the periods of attentiveness and inattentiveness at two-hour intervals throughout the day prior to hatching and the days that hatching began.

was most in evidence during the morning and evening hours. After 7:00 P.M. there was a marked increase in the length of the periods of attentiveness with the beginning of nightfall and a drop in the temperature of the air.

The day that hatching began, the general trend of the attentive periods was similar to what it had been prior to that time, but the variations in range tended to increase, the average length of the periods varying from 4.2 minutes in the evening to 19 minutes for the 11:00 to 1:00 interval, and amounted to 26 minutes in the case of one female. This increase during the middle of the day seems to be a response on the part of the female to protect her eggs from the direct rays of the sun during that part of the day. The nest of the Yellow-headed Blackbird is of the open type and is attached to the upright stalks of vegetation which afford very little protection to the contents of the nest especially during the middle of the day when the sun is directly overhead. At the time of hatching the need of protecting the newly-hatched young from the heat of the sun may be even greater than in the case of the eggs as shown by the response of the female in increasing the length of the periods spent at the nest during that time (Figure 2).

The periods of inattentiveness were much shorter than the periods of attentiveness and their range of variation throughout the day was less. The average length of these periods was considerably reduced at the time hatching began, but prior to the time of hatching and at the time hatching began there was the same general trend in the length of these periods, which was somewhat the reciprocal of the periods of attentiveness, being longest in the morning and evening, when the birds were doing most of their feeding, and shortest during the middle of the day when the eggs and young were being protected from the heat of the sun.

The average duration of both periods was reduced 2.4 minutes after the eggs began to hatch (Table 5), but the greatest percentage of reduction occurred in the periods of attentiveness. Prior to the time of hatching the average length of the inattentive periods was 60 per cent as long as the average for the attentive periods, whereas after hatching

TABLE 6

ATTENTIVENESS AND INATTENTIVENESS IN RELATION TO THE TIME OF HATCHING

	Hours of observation	Ave. length of periods in minutes	Ave. No. periods per hour	Total No. of periods	Per cent of total time
Before hatching began					
a. Attentiveness....	55.2	10.0	3.8	205	62.5
b. Inattentiveness...		6.0		205	37.5
First day of hatching					
a. Attentiveness....	28.5	7.6	5.3	142	68.0
b. Inattentiveness...		3.6		141	32.0

began it amounted to only 47.4 per cent. The amount of time spent on the nest was thus increased from 62.5 per cent prior to the time of hatching to 68.0 per cent at the time that hatching began.

Behavior of Females

The females seldom flew directly to their nests but would alight in the vegetation about 5 or 6 feet away and then make their way through the vegetation to the nest, each female approaching her nest from some one particular direction.

Just before leaving their nests the females would always emit a series of chirps and while off their nests they spent most of their time feeding. During the middle of the day this feeding was primarily confined to the vegetation of the nesting area and around the margin of the marsh, but during the morning and evening feeding periods they sometimes fed outside the nesting area, going to the adjacent fields and pastures.

The incubating females were very easily disturbed and were seldom found on their nests unless they were observed from a blind. When their nests were being visited they would usually leave very silently before the investigator was near enough to witness their departure. However, they exhibited considerable individuality and two particular females strongly resented the presence of the writer each time their nests were approached. None of them would hesitate to drive an intruding bird, of their own species or a different species, away if their nests were approached too closely. The females exercised dominion over a small area immediately around their nests, but failed to recognize the boundaries of the male's territory in which they nested (Fautin, 1940). The emitting of an alarm call by one of the members of the colony would also cause them to leave their nests and fly to the assistance of the one that had sounded the alarm. Such cooperative behavior was witnessed on several occasions. On one occasion, when an American Bittern (*Botaurus lentiginosus*) visited the marsh, it was so severely attacked that it could not escape by flight and crawled down among the dead bulrush stems to avoid the onslaught until the confusion subsided and part of the Yellow-heads had retired from the scene of the conflict.

Behavior of the Males

Although the males did not assist in the incubation of the eggs, they were usually stationed in their respective territories and on guard to prevent the intrusion of any trespassers. They were very cooperative whenever an intruder visited the colony and entered into the conflicts described above jointly with the females. After such conflicts had subsided they would retire to their respective territories and reassert their territorial intolerance for each other (Fautin, 1940). Whenever the nests were being investigated, the males were very hesitant about leaving and would often sit near the nest and chirp. Such behavior was

frequently used to a good advantage in locating new nests during the early part of the nesting season.

The males were never observed to call the females from their nests. There was no evidence that they assisted the females in any way during the incubation period except to prevent the intrusion of trespassers.

No yearling males remained in the areas within which the nesting colonies were situated, although they were present during migration and in the adjacent vicinity. A flock of 28 females and 59 first-year males were located May 7 in the tamarix about one-half mile south of the Provo River colony. This flock remained in that area until the nesting season was practically over and by May 16 had increased to 225 or 250 members of which more than half were yearling males. The habitat occupied by this non-breeding flock was very similar to that of the Provo River colony, and nesting conditions were apparently just as favorable, yet none of these birds nested. Since no yearling males occurred in either of the breeding colonies and were not found breeding elsewhere, it is very probable that they do not breed until the second year as in the case of the Boat-tailed Grackle (McIlhenny, 1937:277). Although the yearling males were more numerous in the non-breeding flock, the females outnumbered the males in the breeding colonies about 3 or 4 to 1, which would make it appear as if the yearling females may breed even though the yearling males do not.

Interruptions in Incubating Activities

Twenty-nine or 24.6 per cent of the completed sets of eggs were destroyed or disappeared from the nests before the time of hatching. The causes of these interruptions were extremely varied and some of them were never determined. Windstorms accompanied by rain were responsible for the destruction of most of the destroyed nests. The action of the wind caused the nests to be torn from their moorings or so loosened them that eventually one side would give way causing the nest to tip over and the contents to roll out. The bottom of one nest was apparently not strong enough to support the weight of the female and broke through, allowing the contents to drop into the water. Another became infested with small black ants which the female attempted to eradicate and in so doing she tore out the bottom of the nest. Two females were recorded as deserting their nests but they may have been killed, for they disappeared from the colony. One female was taken from her nest by a predator of some sort, the nest and supporting vegetation being showered with her feathers. Mashed egg shells were found in the bottoms of 2 nests in the Lakeview colony although the nests remained intact. The eggs from 11 other nests suddenly disappeared, leaving no evidence of their fate. The cause of these last types of interruptions was never determined, although it was evidently the work of an animal of some kind. Similar interruptions have been reported by T. S. Roberts (1909) and Linsdale (1938).

Success and Failure in Hatching

One hundred and twenty-nine eggs, or 29.1 per cent of all the eggs laid, failed to hatch, with the result that 314 young were hatched from a total of 443 eggs (Table 1). Of this number, 90 or 20.3 per cent were destroyed or disappeared from the nests before the time of hatching. The other 8.8 per cent failed to hatch because of being infertile or addled. The percentages given for infertile and addled eggs in Table 1 are based on the total number of eggs laid, but since some eggs were destroyed before the time of hatching these percentages do not represent the true rate of occurrence of addling and infertility. If only those eggs are considered which occurred in undisturbed sets the percentages for addling and infertility become 11.7 and 10.4 per cent in the Provo River and Lakeview colonies respectively.

The number of eggs failing to hatch in undisturbed nests in May was much lower than the ones which were laid later and which were due to hatch in June. During the month of May no more than one egg failed to hatch in any one set in either colony, whereas in June two eggs failed to hatch in one three-egg set, one four-egg set, and one five-egg set; and 3 eggs failed to hatch in one four-egg set. Only 2 eggs failed to hatch in one set of 3 eggs during the month of June in the Lakeview colony, while in all other sets no more than one egg failed to hatch in any one set.

When the hatching success attained by these colonies (Table 1) is compared with that of other species, given in the following table, it

TABLE 7

Hatching Success

Species	Reference	Number of eggs	Young hatched	
			No.	Per cent
Red-winged Blackbird	Williams, 1940	214	156	73.0
Yellow-headed Blackbird	Fautin	443	314	70.9
Oven-bird	Hann, 1937	161	102	63.4
Song Sparrow	Nice, 1937	854	510	59.7
Yellow-headed Blackbird	Roberts, 1909	123	55	45.8

will be seen that the success attained in the Provo colony (75.7 per cent) is greater than that of any of these other studies, approximating that of the Red-winged Blackbird (Williams, 1940). The success attained in the Lakeview colony (60.6 per cent) is about the same as that of the Song Sparrow (Nice, 1937) and a little lower than that of the Oven-bird (Hann, 1937). However, it is much higher than that of the colony of "Yellow-heads" studied by T. S. Roberts (1909) in Minnesota. Predation was evidently abnormally high in the colony studied by

Roberts since all of the progeny of the colony were eventually destroyed. Nice (1937:143) has compiled the data from six studies of passerine birds that nest in the open in which 1,225 young were hatched from 1,994 eggs, thus giving a nesting success of 61.4 per cent.

The Provo River colony, being situated on the edge of Utah Lake, was subjected to much more wind than the Lakeview colony and the tamarix and willows being tall and slender were often vigorously whipped back and forth with the result that nests were sometimes completely destroyed or torn loose from their moorings and the contents tipped out into the water. The nests of the Lakeview colony were not subjected to this sort of damage because the vegetation was more dense, the nests were placed nearer the water, and the wind movement was not so great. During one storm 4 nests were completely destroyed and 7 others torn loose and tipped over in the Provo River colony, whereas only one nest was damaged in the Lakeview colony. In spite of the fact that the nests of the Lakeview colony were better protected from the hazards of wind and storm, the hatching success in this colony was 15 per cent less than in the Provo River colony. The per cent of addled and infertile eggs was much the same in both colonies but the per cent of eggs destroyed, principally by predation, in the Lakeview colony was more than double that of the Provo River colony (Table 1).

The size of the colony has been found by Darling (1938) to affect the nesting success of the colonial-nesting Lesser Black-backed and Herring Gulls. He advances the idea that the social interactions and relation of the members of the colony has a cumulative stimulating effect on the reproductive functions of the members which speeds up the breeding cycle and thus shortens the nesting period in the larger colonies. The interval of time during which predation of eggs and nestlings can occur is thus reduced and the chances for a higher degree of nesting success being attained are increased. The occurrence of a greater number of available predatees, in the case of the larger colonies, would also tend to reduce the total percentage taken by predators during that time and thus contribute to a higher degree of nesting success.

The nesting period of the smaller Lakeview colony was about two weeks longer than that of the Provo River colony and consequently afforded a longer period for predation to occur, which may have contributed to the smaller degree of nesting success. Whether or not the longer nesting period of the Lakeview colony, in comparison with that of the Provo River colony, was due to a lesser degree of functional reproductive stimulation in keeping with "Darling's Principle" or whether it was merely coincidence, is a controversial matter and is in need of further study. Social stimulation during the breeding cycle probably varies in its importance in different species because Brian Roberts (1940) has found in his study of the breeding habits of penguins that there was no evidence of a minimum threshold number of

birds necessary to enable them to complete the reproductive cycle; that egg-laying began no earlier in the larger colonies than the smaller ones; and that ovulation was not restricted to a shorter period of time in the larger colonies.

Discussion

The period from the day that the last egg is laid until the first egg hatches is often the interval of time used in determining the length of the incubation period for a particular species of bird. This interval of time is used on the assumption that incubation is not begun until the last egg is laid and is not valid unless such has been shown to be the case. Such an assumption is not always true because many birds begin incubating their eggs before the clutch is completed. Consequently the time that each egg is laid and the time that it hatches must be known before the length of the incubation period can be accurately determined, otherwise it will appear to be considerably shorter than it really is.

T. S. Roberts first (1909) gave the incubation period of the Yellow-headed Blackbird as 10 days, stating that from the time the last eggs were deposited until the first ones hatched varied from 9 to 11 days, being 12 days in one case. He points out that the eggs hatched very irregularly, in some cases 2 eggs hatching the first day and then one each consecutive day, while in other sets only one egg hatched each day. An analysis of Roberts' nesting records, taking into consideration the sequence in which the eggs of each set hatched, indicates that the incubation period of these birds is 12 to 13 days in length and that incubation was usually begun at the time the first or second egg was deposited, being delayed until the third egg in only one set. Roberts later evidently recognized this error because in his "Birds of Minnesota" (1932, vol. 2:297) he gives the incubation period as 12 to 14 days.

The length of the incubation period of most members of the family Icteridae ranges from 11 to 14 days, being 11 or 12 days in the Red-winged Blackbird (Allen, 1914); 11 to 14 days in the Cowbird (Nice, 1937; and Hann, 1937); 14 days in the Boat-tailed Grackle (McIlhenny, 1937) and the Eastern Meadowlark (Saunders, in letter) and about 11 days in the Tri-colored Blackbird (Lack and Emlen, 1939). It is to be expected therefore that the incubation period of the Yellow-headed Blackbird would fall within this range.

Summary

The nesting activities of two colonies of Yellow-headed Blackbirds, located in the vicinity of Utah Lake west of Provo, Utah, were studied from April to mid-September. Eighty-three females nested in the Provo River colony and 40 in the Lakeview colony.

Egg-laying began May 7 and 61.8 per cent of the females laid their first egg within one day after the completion of the nest. The number

of eggs per set varied from 2 to 5, with 4 the most common number (68.1 per cent).

The females were not assisted by the males in any way in the incubation of the eggs, 56.6 per cent of them beginning incubation at the time the second egg was laid, with a tendency for the beginning of incubation to be delayed longer the larger the clutch. The length of the incubation period varied from 12 to 13 days, 74.6 per cent of the eggs hatching in 12 days.

The attentive periods during incubation ranged in length from one to 41 minutes, with an average of 9.1 minutes. These periods were longest during mid-day when the females were seemingly protecting their eggs from the sun. During 83 hours of observation the females spent an average of 63.9 per cent of their time on the nest, with a range from 53.1 to 69 per cent.

The inattentive periods ranged in length from one to 18 minutes, with an average of 5.4 minutes. These periods tended to be longest during the morning and evening hours when feeding was most intensive.

The hatching success of the larger Provo River colony amounted to 75.7 per cent, while that of the smaller Lakeview colony was only 60.6 per cent, giving an average of 70.9 per cent for the two. Wind and predation were responsible for the destruction of 90 (20.3 per cent) of the eggs before the time of hatching, and 39 (8.8 per cent) failed to hatch because of being addled or infertile. The lesser degree of nesting success of the Lakeview colony was due to a greater amount of predation which in turn may have been the result of a more prolonged nesting season.

Acknowledgements

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GENERAL NOTES

Great Blue Heron Spearing Fish.—On March 14, 1939, our party which included Maurice Brooks and Robert Patterson, had stopped to observe a group of water-fowl feeding in a small pond along the Huron River in Wayne County, Michigan. On the opposite shore we saw a Great Blue Heron (*Ardea herodias herodias*) strike into the water to catch a 9 to 10 inch fish. The heron carried the wriggling fish, which appeared to be a bullhead, between its mandibles while walking to the bank. Here the bird laid the fish down on the ground, poised motionless for a few seconds and then, using his closed beak as a spear, drove it through the fish. The bird shook the fish off and again poised erectly above it. A second swift thrust and the fish was speared again.

In all the bird speared the fish four times and at the end of the fourth time adeptly transferred the fish between its mandibles and swallowed it. The bird seemed to have difficulty swallowing so large a fish. He immersed his bill in the water and seemed to regurgitate something only to swallow it again. For the next five minutes the bird took little sips of water about every 15 seconds, and meanwhile visible contractions of the throat indicated he was trying to swallow. At the end of this time the bird assumed the familiar erect feeding position. He did not however do any more feeding but flew away out of sight.—John L. George, *Department of Zoology, University of Michigan, Ann Arbor, Michigan.*

Prairie Falcon at Oberlin, Ohio.—On September 20, 1940, Lloyd Hugo Heidgard, an Oberlin College student, captured a Prairie Falcon (*Falco mexicanus*) that had become entangled in a wire chicken fence in Oberlin. He kept it on leash for some days, and succeeded in teaching it to be unafraid of him, but was not able to get it to eat enough to keep it in good condition, so he sent it to Bear Mountain (New York) Trailside Museum. It escaped from there and has not been heard from since, although Director Kenneth H. Carr offered a reward for its return.—Lynds Jones, *352 West College Street, Oberlin, Ohio.*

Note on the Courtship of the Black-necked Stilt.—The nonmusical, monotone cry of the Black-necked Stilt (*Himantopus mexicanus*) has an insistent quality which compels attention when the call is often repeated. Late one afternoon in early April the reiterated *kwa, kwa, kwa* of more than one Stilt led me along the Gulf beach of Sanibel Island, through a tangle of saw grass to a hidden pool of brackish water some two hundred feet inland. Although my approach was not especially careful, the two pairs of Stilts which had appropriated this pond seemed unaware of my presence as I sat upon a tussock of grass at the edge of the pool. The four birds were close together and the members of each pair were attentive to one another as they stood face to face in the shallow water about two feet apart, bowing, fluttering wings and frequently half leaping —half flying a few feet upward into the air. After a few moments of this charming play, one bird—probably the male, though sex is indistinguishable at a distance—executed a flying leap over the back of his partner and with incredible swiftness kicked up a shower of spray, using the feet alternately. The shower bath seemed to give pleasure to the courted bird and immediately the two faced about and commenced a repetition of the bowing, wing-fluttering, leaping, and sprinkling.

Presently, quite suddenly and synchronously, all four birds flew steeply upward to a considerable height where they remained for some time flying together in wide circles, giving utterance to their loud, sharp call. Gradually their arc of flight narrowed and quite abruptly the four birds spiralled downward to alight in the shallow water and begin anew the same ritual of bow, flutter, leap, spray.

This sequence was repeated again and again during the hour and a half I sat upon the grassy tussock. The Stilts took no note of my presence nor departure and until late in the night their continued cries told that the courtship was prolonged by the light of the moon.—LOUISE M. PERRY, *Sanibel, Florida.*

Where is the Marbled Murrelet in Early Summer?—During field work in 1940 at Sitka, Alaska, which involved almost daily trips on salt water, several observations were made on the little-known Marbled Murrelet (*Brachyramphus marmoratus*).

This species was seen occasionally from February 28 on throughout the spring. By April 26 they were invariably seen in pairs; by May 2 they were common in the upper parts of Sitka Sound; from then on a few birds were seen daily until May 22. From May 22 until June 21 no Marbled Murrelets were seen. After June 21 they were noted commonly until September 10, when I left town. On July 19, 24, and 25 adults were seen carrying fish, presumably for their young, over salt water towards the mainland of Baranof Island.

During July, while working as a nightwatchman, I saw and heard murrelets flying inland just after sundown and out to sea about dawn each morning. The first juvenile noted was collected, on Sitka Bay, August 24.—J. DAN WEBSTER, *2381 Thornton Avenue, Newark, California.*

Winter Association of Pairs of Ground Doves in Florida.—During a series of quail trapping and banding studies conducted on the University of Florida Conservation Reserve at Welaka, Florida, a number of trapping records were obtained of the Eastern Ground Dove (*Columbigallina passerina passerina*). Among these records are several that seem to indicate that Ground Doves may remain mated through the winter. In addition I observed during the winter many instances of the apparent attachment of one member of a pair to the other. This, as well as the very common winter field observation of two of these doves together, supports the evidence obtained by trapping.

The captures of the two pairs of birds that best illustrate this association of apparently mated doves are discussed below. Unless otherwise stated, all of the birds were caught in the Stoddard "standard" quail trap, and no other doves were taken with these pairs in any of the instances cited.

On August 21, 1939, a pair of Ground Doves were captured after they had entered a large wire enclosure. On January 20, 1940, these birds were again taken together, this time in a trap 350 yards from the scene of their first capture. The most conclusive records are those of a pair that were trapped together three times: October 25, 1939; December 8, 1939; and January 11, 1940. Between the October and December trappings the pair had moved a mile—the greatest movement that was shown in the numerous recaptures of banded Ground Doves throughout the winter.

The breeding season of the Ground Dove extends from February to October (A. H. Howell, "Florida Bird Life," 1932 :282), although Oscar E. Baynard (*Oologist*, 26, 1909:5) reports finding eggs in every month of the year.—O. EARLE FRYE, JR., *Department of Biology, University of Florida, Gainesville, Florida.*

Utah Bird Records.—A number of bird specimens which provide new state records, verifications, or changes in previously published records have accumulated at Dixie Junior College. With the exception of the Ring-necked Duck, all specimens discussed in this note were identified by Dr. Clarence Cottam and Dr. H. C. Oberholser of the Fish and Wildlife Service, Washington, D.C.

A Pacific Loon (*Gavia arctica pacifica*) was found dead beside U. S. Highway 91 about one mile south of Beaver, Beaver County, Utah on October 18, 1940, by Mr. Lee Kay of the Utah State Fish and Game Department. He gave it to Mr. A. A. Paxman of the Woodward High School of Saint George who very kindly presented it to Dixie College for preservation. This seems to be a new state record.

The Yellow Warbler (*Dendroica aestiva*) of this region was listed by Vasco M. Tanner (*Condor*, 29, 1927:199) and by me (Ross Hardy and Harold G. Higgins, *Proc. Utah Acad. Sci., Arts, and Letters*, 17, 1940:95–111) as the race *sonorana*. Seven specimens from Washington and Juab counties, including both transients and breeding birds, have been identified as *morcomi* by Dr. Oberholser.

Two specimens of vireo reported (Hardy and Higgins, *loc. cit.*) as *Vireo belli pusillus* should probably be listed as *V. b. arizonae*. The oriole listed as *Icterus cucullatus sennetti* is *I. c. nelsoni*. Neither of these two forms has been previously reported from Utah.

Two races of Audubon Warbler migrate through Saint George. Specimens of *Dendroica auduboni auduboni* were taken April 12, 1936; March 8, 1940; and March 25, 1940 at Saint George. Specimens of *Dendroica auduboni memorabilis* were taken at Saint George, March 8, 1940 from the same flock as *D. a. auduboni*. Additional specimens of *memorabilis* were obtained at Saint George, March 27, 1940 and at Cabin Valley in the Pine Valley Mountains, Washington County, June 3, 1939 and June 15, 1940. The species evidently nests in the latter area. Another specimen was taken near Navajo Lake in Kane County August 19, 1939, while yet another was obtained at Sunnyside, Carbon County, October 12, 1935. The race *memorabilis* was previously reported by S. B. Benson (*Univ. Calif. Publ. Zool.*, 40, 1935:445) for Navajo Mountain in San Juan County.

A male Gray Vireo (*Vireo vicinior*) taken June 29, 1940, in the Beaverdam Mountains of Washington County is not typical but may represent a case of symmetrical albinism as its two outer tail feathers are white.

Specimens of the following races of Washington County birds were also examined:

Anthony Green Heron (*Butorides virescens anthonyi*).—Saint George, Washington County, September 17, 1936.

Western Least Bittern (*Ixobrychus exilis hesperis*).—Saint George, May 20, 1938.

Texas Nighthawk (*Chordeiles acutipennis texensis*).—Three specimens from Washington County in May, 1940.

Mountain Chickadee (*Penthestes gambeli gambeli*).—Five specimens from Carbon, Kane and Washington counties.

Lead-colored Bush-tit (*Psaltriparus minimus plumbeus*).—Sunnyside, Carbon County, December 17, 1935; and Beaverdam Mountains, Washington County, March 9, 1940.

Rocky Mountain Nuthatch (*Sitta carolinensis nelsoni*).—Sunnyside, Carbon County, November 22, 1935; and Pine Valley Mountains, Washington County, June 13, 1940.

Western Yellow-throat (*Geothlypis trichas occidentalis*).—Ten specimens from Juab and Washington counties.

Dwarf Cowbird (*Molothrus ater obscurus*).—Four specimens were taken at Saint George: April 26, 1940; May 7, 1939; May 15, 1940 and May 16, 1940.

Nevada Cowbird (*Molothrus ater artemisiae*).—A male was taken at Saint George, May 14, 1940.

A Ring-necked Duck (*Nyroca collaris*) was taken at Ivins Reservoir in Washington County by Harold Higgins on April 20, 1940. Numerous observations of this species in the spring of 1941, as well as in 1940, seem to indicate that it is somewhat more common in Utah than has been previously supposed.—Ross Hardy, *Dixie Junior College, Saint George, Utah.*

Number of Contour Feathers in the English Sparrow.—In 1936 Alexander Wetmore published an account (*Auk*, 53: 159–69) of a study made on the number of contour feathers on certain birds. The work interested me greatly and I intended to accept the suggestion he gave to follow some common species throughout the year. Various circumstances have prevented the completion of the problem but it seems desirable to place on record what observations were made.

The English Sparrow (*Passer domesticus*) was selected. The results are tabulated below. Wetmore's single specimen of the English Sparrow is also included. The methods employed were much the same as Wetmore's. All the specimens were collected in the vicinity of Ann Arbor. Before plucking the feathers, notes were made on the condition of the plumage and measurements taken of the wing and tail. The sex of the bird was determined by dissection after completion of the feather counting. The feathers were counted in lots of fifty. Only the contour feathers were counted, the downs and filoplumes were not included.

The disparity between Wetmore's results and mine became evident at the completion of the first specimen. Unable to explain this difference, I felt that perhaps I had been counting many down feathers. On specimen No. 3 special care was given to every feather that was downy in nature. All doubtful feathers were examined under a microscope to determine accurately their nature. I found that there were very few down feathers on the bird. When I removed only those feathers that actually formed a part of the external covering of the bird, an underlying layer of fluffy feathers was left. These downy feathers were structurally contour feathers. The number of these feathers was far too small to account for the difference between Dr. Wetmore's results and mine. On specimen No. 3 these underlying feathers numbered 211 out of the total of 3615.

In a letter commenting on the differences in our results, Dr. Wetmore stated: "I remember the single male English sparrow that I plucked very well indeed. It was an adult in very worn dress taken here during hot weather. The small number of feathers impressed me at the time, and I have gone back again to the original record for this specimen to verify the total as indicated in the *Auk*. I hesitated to include the record with the others but finally put it in."

Despite the fact that his specimen was unusual in the small number of feathers, it is quite evident that the difference between our results is due to some other cause. It would be interesting to know if others have done work of this kind.

There was not much individual variation in the specimens that were counted at the same time of the year. The three mid-winter birds, Nos. 3, 4, and 5, had totals of 3546, 3615, and 3557 respectively, and the variation between the two extremes was 69. It is interesting to note the differences between the two birds collected in July (Nos. 7 and 8). The adult male had 20 pin feathers but extensive molting had not started. The immature bird had no pin feathers. The totals for the two birds are surprisingly similar. The adult male had 3138 feathers and

DATA OF INDIVIDUALS COUNTED

No.	Sex	Date	Total number of feathers
1	♂ im.	16 Nov. 1936	3352
2	♂ im.	28 Nov. 1936	3514
3	♀ ad.	10 Jan. 1937	3546
4	♂ ad.	10 Jan. 1937	3615
5	♂ ad.	20 Feb. 1937	3557
6	♀ ad.	12 Mar. 1937	3515
7	♂ ad.	5 July 1937	3138
8	? im.	5 July 1937	3179
*	♂	2 July 1933	1359

* Wetmore's specimen.

the immature bird had 3179 feathers. Comparing the two summer birds with the three mid-winter birds, it is noted that a loss of 11.5 per cent has taken place. A gradual seasonal change is indicated by the November and March specimens.—ARTHUR E. STAEBLER, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan.*

Does the Southern Hairy Woodpecker Occur in Oklahoma?—The Hairy Woodpecker, *Dryobates villosus,* occurs throughout Oklahoma save in the treeless "Dust Bowl" section. In the extreme northwestern Panhandle (the Black Mesa country) it is represented by a western race, probably *D. v. monticola* Anthony. (Two specimens taken near Kenton, Cimarron County appear to be intermediate between *monticola* and *leucothorectis.* See G. M. Sutton, *Annals Carnegie Museum,* 24, 1934:23). Here it inhabits the juniper- and pinyon-sprinkled mountainsides, rarely, if ever, descending to the cottonwoods of the bottomlands.

So effective a barrier is the treeless Panhandle plain that the species has nowhere invaded the Black Mesa country *from the east,* hence there is no zone of intergradation between *monticola* and any eastern subspecies. But throughout the main body of the state, to the very edge of the Dust Bowl, the Hairy Woodpecker is to be found. The senior author has encountered it repeatedly in Greer, Beckham, Roger Mills, Ellis, and Harper counties, and he is convinced that it ranges westward and southward wherever there is good tree-growth to and across the Texas state line.

Now to what race the Hairy Woodpeckers of the main body of the state belong? Mrs. Nice, in her useful "Birds of Oklahoma" (*Publ. Univ. Okla. Biol. Surv.,* 3, No. 1, 1931) lists two subspecies, *D. v. villosus,* "the breeding form of central Oklahoma"; and *D. v. audubonii,* a "resident in eastern Oklahoma."

During the course of the senior author's investigation of Oklahoma birdlife in 1936 and 1937 five Hairy Woodpeckers (four adult males and one juvenile male) were collected in the main body of the state. All these prove to be *villosus.* Not one of them tends to be small or dark. The most significant individual of the series, an adult from Broken Bow, McCurtain County, in the extreme southeastern corner of the State, is large even for *villosus,* the wing measuring 121 mm. (Ridgway's average for twenty-five male *villosus* is 120.4), and the bill 32.5 (the extreme in Ridgway's series is 33). Among eighteen adult male *villosus* in the Cornell University collection (from New York, New Jersey, and western Virginia) only one is as long-billed as this McCurtain County bird.

Determined to ascertain whether *audubonii* has actually ever been taken in Oklahoma, the authors borrowed from the University of Oklahoma Museum of Zoology their entire series of *Dryobates villosus,* six specimens, four of them adults, and all but one with data. The only bird in the lot marked *audubonii,* a young male taken July 1, 1923, in McCurtain County, is subspecifically unidentifiable. It is blunter-billed than the adult male from the same region, of course—that is to be expected in so young a bird. The only other specimen in the series that might conceivably be called *audubonii* is a smallish, short-billed female wholly without data. Among the comparative material at hand are four fresh topotypical *D. v. audubonii,* collected by Mr. Herbert L. Stoddard in the Thomasville region of Georgia.

As a result of finding (a) that the only breeding McCurtain County specimen available is *villosus* and (b) that the McCurtain County *audubonii* specimen listed by Mrs. Nice is a racially unidentifiable young bird, the authors are forced

to conclude that *Dryobates villosus audubonii* has not yet actually been taken in Oklahoma and that it therefore has no right on that state's list of birds at present.

Measurements, in millimeters, of Oklahoma *Dryobates villosus*:

Number	Age	County	Culmen	Wing	Tail
MALES					
C. U. 6436	Adult	Ellis	32	122	69
C. U. 6437	Juv.	Ellis	28	114	70
C. U. 6438	Adult	Noble	33	118	60 (worn)
C. U. 6440	Adult	Murray	32	118	67
C. U. 6439	Adult	McCurtain	32.5	121	72
U. O. M. Z. 5704	Juv.	McCurtain	30	118	66
U. O. M. Z. 3279	Juv.	Pottawatomie	26.5	115	65
U. O. M. Z. 5502	Adult	Cleveland	34	116	72
FEMALES					
U. O. M. Z. 5500	Adult	Cleveland	30	119	73
U. O. M. Z. 5507	Juv. (?)	Cleveland	29	116	69

—GEORGE MIKSCH SUTTON and ERNEST P. EDWARDS, *Department of Zoology, Cornell University, Ithaca, New York.*

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

Ralph Beebe—2 books, 6 pamphlets, 11 mimeographed publications.
P. L. Errington—4 reprints.
Horace Groskin—1 reprint.
Lynds Jones—13 reprints, 23 magazines.
Amelia R. Laskey—1 reprint.
Fred J. Pierce—3 pamphlets.
Evelyn J. Schneider—1 mimeographed volume.
Thomas G. Scott—4 reprints, 3 mimeographed reports.
L. L. Snyder—1 pamphlet.
Dayton Stoner—1 reprint, 1 bulletin.

EDITORIAL

There still seems to be some misapprehension among Wilson Club members in regard to the significance of the several classes of membership. To make the matter quite clear we may say that only in the case of Honorary Members does the Club make any attempt to recognize achievement in ornithology or service to the organization. The other classes of membership simply give the bird student who appreciates particularly the work of our Club a chance to give it stronger backing to the extent that he is able. A number of our members have already generously increased their membership this year, thus strengthening our organization and enlarging the scope of its work. We hope that other members planning help in this way will write to our Treasurer in time for him to make the necessary correction in the complete membership list which is to be published in the September *Bulletin*.

We have had such an enthusiastic response to our suggestion in the March *Bulletin* that we propose to begin in an early issue publishing information on current research projects in ornithology. In the beginning at least, we should like to emphasize the more extended studies of single species. We now solicit such information. Please include all studies not yet published but do not report projects which are merely planned or barely begun. For the information of the Editor only, please indicate when the work was begun.

OBITUARY

Claud B. Ticehurst, noted British ornithologist and editor of *The Ibis*, died on February 17, 1941. His early work was mainly concerned with British birds but showed a remarkable breadth and originality. Following his service in India during the World War, he published extensively on European and African birds and became a leading authority on the birds of British India.

Elmer T. Judd of Cando, North Dakota, died on February 27, 1941. Mr. Judd worked in the field on North Dakota birds with Louis B. Bishop, William Hoyt, Arthur C. Bent, Norman A. Wood, and others and was himself an authority on the birds of the state.

Ornithological News

The Wildlife Society has made its annual award for the outstanding paper of the year 1940 to Dr. Paul L. Errington, Mrs. Frances Hamerstrom and F. N. Hamerstrom, Jr., for their research bulletin on "The Great Horned Owl and Its Prey in North Central United States." The award is in the nature of an engrossed scroll and a citation in *The Journal of Wildlife Management*. (*Science*, 93, April 11, 1941: 346).

C. Gordon Fredine, formerly game and fish consultant with the Minnesota Department of Conservation, has been appointed Assistant Professor of Wildlife Management at Purdue University where he will be engaged in research upon wildlife problems.

Maurice Brooks will teach this summer at the University of Minnesota Biological Station at Itasca Park.

S. Morris Pell has been appointed manager of the Huron Mountain Club, west of Marquette, Michigan.

The Boston Society of Natural History announces that original, unpublished essays on any subject in the field of ornithology are eligible for the Walker Prize competition for 1942. For details apply to the Secretary, 234 Berkeley Street, Boston, Massachusetts, after August 15, 1941. Manuscripts are due on May 1, 1942.

WILDLIFE CONSERVATION

Recent Federal Reports on Wildlife Conservation

Two reports of major importance on the progress of wildlife conservation in the United States have been published recently. These reports are (1) "The Status of Wildlife in the United States, Report of the Special Committee on the Conservation of Wildlife Resources," Senate Report No. 1203, 76th Congress, 3rd Session (Gov. Printing Office, Wash., 1940: 457 pp., 74 pls.) and (2) "Conservation of Wildlife, Hearings Before the Select Committee on Conservation of Wildlife Resources," House of Representatives, 76th Congress, 3rd Session (Gov. Printing Office, Wash., 1940: 429 pp., map). These reports present a comprehensive picture of what is being done and what needs to be done for wildlife in the United States.

The outstanding element in both publications is the emphasis placed on the importance of obtaining wildlife conservation on farm land. The Senate Report includes a list and discussion of subjects investigated by the Senate Wildlife Committee, the legislation enacted since the organization of the Committee, and the text of federal laws relating to the protection of wildlife. Reports on the wildlife programs of the eleven federal agencies make up the bulk of the publication.

Under the heading "Future Needs of the Conservation Program," in the report of the Biological Survey, it is stated:

"The most pressing need in the national movement to restore the Nation's wildlife resources is an effective means of reaching the owners and users of land to advise them of the many relatively simple and inexpensive practices which will restore environment conducive to increased wildlife populations."

"Wildlife is an organic resource, a product of the soil, inseparable from the land. It must depend on the land for its nourishment, its protection, and its very existence. On the other hand, the earth must have its protective cover of trees, shrubs, and grasses to check erosion and to return organic substances to the soil."

"Fortunately, practices designed to encourage wildlife production invariably conserve soil and water resources and build back some of the fertility wasted through unwise agricultural practices." . . .

E. G. Holt of the Soil Conservation Service pointed out a similar approach in his report, as follows:

"Eighty-five percent of the land of the United States is used for agricultural purposes, including grazing. Eighty-five percent of all hunting takes place on agricultural land, and on it 70 percent of the wild fur crop is caught by farm boys. Obviously, the pattern of use developed on agricultural land is of paramount importance to wildlife, and it is clear that unless plans for wildlife are developed as part of the plans for agriculture, most wildlife produced in the country will be largely accidental."

What has been emphasized for game conservation in these reports is true largely for all forms of wildlife. To facilitate the carrying out of conservation activities on farm land, an extension program for wildlife is advocated by the Biological Survey in their report.

The report to the House of Representatives includes the testimony of the various government agencies dealing with wildlife, relative to what they are doing and what needs to be done. In addition, testimony of State Game and Fish Commissioners from twenty-two states was presented.

Included in the hearings was a report of fundamental importance in wildlife conservation upon which any sound plan for future programs dealing with private land must be based. This report is the result of a joint study made by the Bureau of Biological Survey and the Bureau of Agricultural Economics, entitled "An Economic Study of Wildlife as a Supplementary Farm Enterprise." It is no doubt the most thorough analysis of the wildlife conservation problem as it

relates to private land that has ever been presented. A few highlights from the report follow:

"Under present conditions of agricultural utilization of land and of wildlife production and utilization, there is little or no opportunity for farmers on good land to make wildlife a profitable supplementary farm enterprise, because farmers on such land are finding that producing wildlife on a sustained yield basis and allowing outsiders to harvest it costs them more than hunters and trappers are willing to pay for hunting and trapping privileges. However, when esthetic and recreational aspects are considered, properly controlled wildlife production and utilization can be made worth while on most farm land as it assists in making the farm and community a better place to live and it can often make use of otherwise waste land." . . .

"Although wildlife continually acts as a check on insect and rodent pests and is known to have helped in repelling pest outbreaks locally, it seldom acts as a complete control of a pest on farm land." . . .

"All of this would indicate that *the chief values of wildlife* to the community, state, or federal government* are its contributions as a foundation for various industries, its stimulus to business, and its contribution in providing esthetic, recreational, and social outlets for the people and *not its direct monetary return to the individuals or to the state.* Its chief value to the individual, whether farmer, hunter, or businessman, is the stimulus it gives his business by attracting people to his community and the esthetic, recreational, and social enjoyment he gets out of it." . . .

"The retirement of submarginal farm land by public purchase will not greatly increase wildlife or the opportunities for its enjoyment for the nation as a whole, because the use made of submarginal land in farms is generally much better than average for wildlife production and utilization, while the grazing, recreational, and residential uses to which much of the retired submarginal farm land is expected to be put in certain areas are adverse to wildlife and its utilization." . . .

". . . The wildlife user must become willing to pay an increased amount for his use of wildlife and the farmer must be willing to accept a large part of his remuneration for his efforts on behalf of wildlife in the form of such intangibles as recreational, aesthetic, and social enjoyment."

"The study indicates the need for a scientific, coordinated conservation program that will integrate wildlife production and utilization into all land-use and soil-conservation programs; and for recognizing the rights of the individual landowner as well as the rights of the wildlife user in all wildlife conservation programs."—Charles A. Dambach.

Pole-traps

The Oregon Cooperative Wildlife Research Unit has publicly advocated pole-trapping of "The great horned owl and hawks" in the interest of game management, with the further comment that "*If** padded jaws are used and the traps are tended regularly, beneficial birds can be released unhurt" (see p. 11 of "Suggestions on Management of Small Game in Oregon," Arthur S. Einarson, *Ore. Exper. Sta. Circ.*, 140. Jan., 1941).

The latter quotation permits the clear inference that any concern for "beneficial birds" is secondary, an inexcusable slip. The whole treatment of raptor control shows a complete disregard of any interest in wildlife other than the hunters', and of the trends of modern studies of predation. One may disagree with the interpretations of the results of these studies, but no serious treatment of predation can afford to ignore them. It is unfortunate that this circular, published primarily for people with little knowledge of the complexities of predation, should so thoroughly do so; it is a reflection on its sponsors that a blanket recommendation of pole-trapping is given instead.—F. N. H.

WILDLIFE CONSERVATION COMMITTEE,
Frederick N. Hamerstrom, Jr., Chairman

* Italics by the reviewer.

ORNITHOLOGICAL LITERATURE

COURTSHIP AND DISPLAY AMONG BIRDS. By C. R. Stonor. Country Life, Ltd., London. 1940: 5½x8¾ in., xvi + 144 pp., 57 pls. 8s. 6d.

In this handsome volume the author, writing from an intimate acquaintance with birds in the Zoological Gardens at Whipsnade and with a background of work in the British Museum of Natural History, besides a wide field experience, gives us minute descriptions of many spectacular and typical displays used by birds in courtship and in combat, with discussion of the principles involved. Mr. Stonor takes the view that most display, though it may be used in fighting, had its origin in its value for courtship purposes. He brings out clearly the three main types of display—that of male before female (or in certain families the reverse state of things of the female wearing and displaying the ornaments); that of mutual display of the two sexes, sometimes with the male playing the leading part and sometimes with absolute parity between male and female; and, thirdly, communal display, such as prevails with the Ruff and the Prairie Chicken. In mutual display the sexes are dressed alike or nearly so, while in the other two types one sex, usually the male, wears the ornaments. The use of special display grounds is also discussed at some length, with detailed descriptions of the courts of the Manakins, the mounds of the Lyre Bird, and the bowers of the various species of Bower Bird.

The descriptions of the displays, reinforced by a set of remarkable photographs largely taken at close range in the Zoological Gardens, show a surprising variety of methods, even in members of the same family. The displays of the Birds of Paradise, for instance, are almost incredibly varied, and each is correlated with the structure of the bird and the disposition and characters of its ornamentation. Where, as usual in this family, the body plumes are the most gorgeous, it is they that are most displayed, and the stiffer plumes of the Great Bird of Paradise are erected over the back, while the long and delicate plumes of the Lesser are arched back to form a drooping cascade of "indescribable grace" and the cobweb-like plumes of the Emperor of Germany's Bird spread a mist about their wearer as he hangs by his feet from the twig of a tree. These are a few of the many displays used by this remarkable family, and the well-known displays of many of the grouse are not less wonderful.

Though the author does not go quite so far as to insist that every peculiarity of plumage, color, and form is adaptive, he leaves the reader with the impression that in his opinion the vast majority have been preserved because of their value to the race; and, indeed, it is hard to disagree with him in view of the evidence he presents. The sexual selection argued in this book is sexual selection up to date—not the mistaken idea that the female is supposed to choose deliberately a male from among many that present themselves, not even the Darwinian theory pure and simple that the most attractive male inevitably attracted the most females, but the theory that, to follow the author in quoting F.H.A. Marshall, "It is the pair which have the highest capacity for mutual stimulation which are, so to speak, selected by Nature for the perpetuation of the race." After discussing hormones, endocrine glands, and the effect of visual images upon the pituitary, the author very pertinently adds, "This is far from shutting out altogether any aesthetic point of view; I for one find it impossible to believe that the harmony of colouring, the brilliance, and the beauty of ornament that so many birds show in their courtship can have been evolved merely because they happen to serve the right purpose, and without their owner or their recipient in the display being in the least conscious or appreciative of them."

Mr. Stonor cites some cases of display that appear to him to be purely for aggressive purposes. Among them he includes the head-shaking of the Ruffed Grouse in which the ruff is expanded. In this, of course, he follows Dr. A. A.

Allen, whose observation of captive birds led him to the conclusion that this display was a threat. Cleveland Grant, however, has shown us in a recent film a wild grouse using this display before a wild female that has approached his drumming-log, and it would seem that only a complete acceptance of the theory that all courtship is actually a matter of intimidation would admit the belief that that female would linger about there for the express purpose of being intimidated.

In treating of communal displays the author mentions the great variety of color and pattern in the ornamental plumes of the Ruff and shows that the females actually appear to select their mates from among the many that are gathered together. He also cites the suggestion that these striking ornaments and the habit of exhibiting them in assemblies may have been evolved for their effect as a mass of color like that of a flower-bed visible from a distance.

The probability that the use of display changes and develops from generation to generation needs emphasis. Everyone knows how such changes as the adoption of trees for roosting by the Rock Dove have come about within a comparatively few years; and Mr. Stonor mentions the belief on the part of some ornithologists that the Lyre Bird's display and care of its display mounds have outgrown their function as a part of the nesting cycle and have become largely recreational in character.

The author stresses the importance of concealing coloration as a factor to be considered when studying the development of display plumage. He even goes so far as to say, "Probably the greatest thing a bird is up against, the most vital and ever-pressing need of its whole existence, is that it must at all costs blend and tone in with its surroundings." Is it possible that the views of Abbott Thayer are at last coming into their own? The reviewer, who, though no blind follower of that extremist, long ago took occasion to ask for a respectful hearing for Mr. Thayer as an expert on color as it appears in nature, is glad to meet with this statement, exaggerated though it may be, and equally glad to see another statement with which Thayer might not have agreed—"But when it comes to courtship, it [the bird] is concerned with the very opposite—with the need for making itself as conspicuous as it possibly can to attract and stimulate a mate, and (probably with a separate ceremony) to drive off potential rivals." And again, still following Thayer, we have, "It seems beyond reasonable doubt that the greens of the Parrots, the bizarre colours of the Fruit Pigeons, the brilliance of the Kingfishers, are not there for use in courtship, and would appear to have concealment from enemies or (with the Kingfishers) prey as their most important object."

There is some discussion of the decisive factors in the development of display. Considering especially the Birds of Paradise, in which the most obvious ornaments throughout the family are the flank plumes, the author thinks that here form preceded function, though he finds the general opinion of ornithologists favoring the view that "it is the display which decides the evolution and development of its mechanism." It might be reasonable to suppose that the two developed concurrently and that neither one actually preceded the other.

This book was written for "the non-specialist interested in natural history and for ornithologists who have not had the time to go deeply into this branch of their subject." Ornithological readers will regret the absence of adequate bibliographical notes and will wish the author had made a point of naming his authority in all cases where he referred to a particular writer. It may be of *some* value to know that the behavior of certain manakins was described to him by a "traveller in Brazil" and that though it "sounds like a real 'traveller's tale,'" it is "confirmed by the independent account of a German naturalist," but the names might have added to the reader's confidence in the story. A minor criticism might be made of the use of the ambiguous word "pairing" when actual coition is really meant.

The book seems to deserve very well the hearty commendation given it by that distinguished ornithologist Mr. Percy R. Lowe in his Foreword.—Francis H. Allen.

ISLAND YEARS. By F. Fraser Darling. Illustrated from photographs by the author. Oxford Press, Toronto, 1940: 6 x 9 in., xii + 306 pp., 37 photos, 5 maps. $3.00.

INAGUA. By Gilbert C. Klingel. Illustrated from photographs taken by the author. Dodd, Mead & Company, New York, 1940: 6 x 9 in., xii + 385 pp., 34 photos. $3.00.

Life on an island holds a special appeal to the field worker, for not only is it an isolated unit in world biology, conveniently delimited and tangible, but its study has an adventuresome flavor that freshens the imagination. These truths, perennially acceptable, are in themselves good reason for the appearance of "Island Years" and "Inagua."

Ornithologists who recall Dr. Darling's splendid books, "Bird Flocks and the Breeding Cycle," "A Naturalist on Rona," and "Wild Country," will find his latest volume, "Island Years," particularly welcome. Here is the human story behind the obtainment of the subject matter of those books, the personal experiences of Dr. Darling, his wife and son, on the uninhabited Scottish islands: Eilean a'Chleirich, Lunga, and inaccessible North Rona. The purposes of the lengthy sojourns on these remote areas are explained briefly for the sake of the story value; the results achieved receive no special attention. And rightly so! Important among these pages are the ways in which the family confronted alone the restless elements, finding moments of great exhilaration and excitement alternating with times of disappointment and despair; numerous episodes such as the serio-comic lot of "Doormat" who, though "the lowliest member of a pack of scriddy hens" brought to Eilean a'Chleirich, performed many a "deed of valour" by being the only member of the flock with sufficient courage to ward off a Raven intruding upon the flock's food supply.

Great Inagua is the southeasternmost island of the Bahamas. Like the Scottish islands it is desolate and forbidding even though inhabited by a small group of dark-skinned natives. On a well-planned, personal, scientific expedition to the West Indies in a ship especially designed for the occasion, Gilbert Klingel unexpectedly landed on this island when his ship became hopelessly wrecked on its shores. Undaunted by this hair-raising and disastrous accident, he turned immediately to the study of the island's web of life and returned on a second expedition to continue it. "Inagua" is a popular account of the investigations conducted from the barren interior to the surrounding depths, sometimes by night, sometimes under glaring sun and against wearisome wind. Although the author's chief interests centered on the races and distribution of numerous lizards of the island, his story brooks no such limitations. Careful detailed descriptions abound; they are elegant, thoughtful, but never sentimental. Ornithologists will find their special interests gratified in many sections of the book, especially in the vivid account of a visit to a colony of Flamingoes numbering three thousand birds and the quest of the Roseate Spoonbills when vast multitudes of mosquitoes brought unendurable torture to the author.

Both of these books are to be strongly commended. Having read one, there is all the more reason for reading the other. Well written, decidedly personalized, entirely authoritative, beautifully illustrated by many thrilling photographs, comparisons between the rich biology of these two dissimilar environments and the differences in the authors' reflections and adjustments are very enjoyable and instructive. Dr. Darling and Gilbert Klingel are ecologically minded to a high degree reached by few popular authors to date.—O. S. Pettingill, Jr.

ORNITHOLOGY LABORATORY NOTEBOOK. By Arthur A. Allen. Comstock Publishing Co., Ithaca, N.Y., 1941: Fourth ed., 8½ x 12 in., [viii] + 204 + 64 unnumbered pp., illus. $3.00.

Most teachers of ornithology in the United States are doubtless familiar with previous editions of this laboratory notebook, and it is certain that the author himself is well known to students of birds. The present fourth edition is based in part upon the experience of thirty-five years of teaching ornithology at Cornell University. Its chief advance over the third edition lies in the inclusion of material on birds of other parts of the country than the eastern United States, thus making the book more widely applicable.

The notebook is well printed, with few typographical errors, on good quality, moderately heavy paper, and the covers are of heavy, tan-colored paper with cloth reinforcement on the back. Its size, 8½ x 12 inches, is convenient for use in a standard looseleaf notebook if one wishes; indeed, some of the sheets are punched for such use. About four-fifths of the book is made up of pages on which the student fills in data obtained from field and laboratory observation of birds and from available literature. Five sets of outline drawings are to be labeled by the student, and so provide a basis for becoming acquainted with the topography of a bird, natural groups of feathers, parts of a feather, and the more important skeletal features. The two blank pages following furnish an opportunity to use this knowledge in sketching and discussing types of feathers and in writing a formal description of some particular bird.

Three good, though largely artificial, keys to all orders and families of birds occurring in the United States and to the nests of common species breeding in the eastern states are a feature of the notebook. All are well illustrated, by line drawings for the keys to the groups, and by excellent photographs of most of the types of nests for that key. Many of the nest photographs show eggs as well, and nearly all include some of the natural surroundings of the nest. For use with the keys to orders and families are several pages for recording the ordinal and familial names of birds identified in the keys. There is a list of the orders and families of North American birds, with blank lines for listing three diagnostic characteristics of each. Two pages provide captioned columns for recording the Latin and vernacular names of the birds previously identified to order and family.

A section is devoted to condensed statements of the winter and summer ranges of birds that have been found in the vicinity of Ithaca, New York. The addition of local dates and regularity of occurrence increases the value of this section for students in central New York. The reviewer feels that the title of the section, "Summer and Winter Ranges of North American Birds, including migration data for central New York" is somewhat misleading in its implied scope. This title, combined with the use of subspecific names and the non-detailed character of the statements of range, would lead most beginning students to think that other races and species do not occur in the eastern part of the country. For example, three races of Horned Lark are given because all have been found at Ithaca, but only one race each of Savannah Sparrow and Song Sparrow. An excellent feature of this section is the presence of accent marks on Latin names. This should prove of much help to students, who usually have difficulty with the pronunciation of these names.

The largest section in the notebook is a series of 100 "life history and identification charts." On each chart is captioned space for data on many features of species identified in the field. Included are places for notes on migration, habitat, habits, sounds, food, economic status, nest, recognition marks, plumages, and eggs. Each page bears a map of the larger land masses of the western hemisphere, which should be a great aid to the student in visualizing and learning distribution and migration routes after they have been indicated on the maps in color. Unfortu-

nately, the maps are Mercator projections, which makes difficult the comparison of size of ranges at different latitudes because of the exaggerated size of northern regions. Twenty-four checklists of species of eastern North America are intended for abbreviated records of information obtained on field trips. Extra spaces are provided at the bottom of each page for additional species.

Another large section comprises 188 fine outline drawings of 200 species of birds, mostly by Louis Agassiz Fuertes and William Montagna, for coloring by the student. Most of the figures are of eastern species, but kinds found in other parts of the country are included, and other figures are so generalized that they can be used for any one of several closely similar species in different regions. Several hawks are shown from the under side, thus bringing out clearly markings of value in field identification. In this connection, the reviewer feels that most beginning students would be saved considerable time by some indication of the kinds of characters most useful in field identification. The egg shapes shown at the end of the section would be more descriptively named, we think, if called ovoid, ellipsoidal, and pyriform, rather than "normal," "oval," and "pointed," respectively.

The notebook has been made more useful to bird students in the west and south by expanding the keys to include all North American families and orders, and by adding generalized drawings and drawings of additional species. Even so, numerous common species are omitted. Of western birds, for example, there are no drawings of Williamson and Red-breasted Sapsuckers, Townsend Warbler, Linnet, Cactus Wren, Evening Grosbeak, Green-backed and Lawrence Goldfinches, and others.

The main purposes of the notebook, as indicated in the preface, are to aid students in identifying birds and to introduce them to other phases of ornithology. For the first of these objectives, the notebook is, in general, well adapted. It seems to the reviewer, however, that certain phases of the latter might well be further emphasized by including exercises on such things as physiology, migration, social habits, habitat relations, song, and geographic variation. Some of these topics are included on the life history charts, but in such a way that there is collected a great mass of detailed information, from which only the exceptional student learns general principles and fundamental information. Specific exercises would provide a firm foundation on which detailed observations of individual species could be built. A few sentences might well be included to explain the concept of life zones, especially as a full-page, colored map of life zones in North and Central America forms the frontispiece, and life zones are used in most of the definitions of ranges. References to a few important books and papers on birds should prove helpful to a beginner.

For learning to identify birds and as a repository for detailed information on species seen in the field, the Ornithology Laboratory Notebook should be of value to many students and teachers in all parts of the country.—Frederick H. Test.

MODERN WILDERNESS. By William Arthur Babson. Illustrated with two paintings by Clifford R. Babson and photographs taken by Carl H. Lester, Jr., and others. Doubleday, Doran & Co., Inc., New York, 1940: 6 x 9 in., xix + 261 pp., 2 col. pl., 24 photos. $3.00.

This book purports to be the story of a wildlife sanctuary—a strip of swamp and woodland in New Jersey bounded by civilization—where the author has made observations of the locality's many forms. But the book has unfortunately missed its mark, for it is no story at all. It is instead a hodgepodge of unrelated chapters showing wildlife—mainly birds—at the perpetual mercy of human interferences: young owls and crows being removed from nests, photographed and reared in captivity; Wood Duck eggs being transferred from natural nests to nests of

domestic hens; surplus jays and squirrels being "popped off" with a .410; innumerable visits to nests resulting in the terrified reactions of the birds in possession. In a few instances there are accounts of observations made after watchful hours but the interpretations of events seen are weak and of little significance. The author shows a knowledge of different species of birds but his references to other living things are couched in such vague terms as "small brown spider," and a "bee of some species smaller than a honey bee." The style of the writing is uneven and rambling; the humor is stilted and unnecessary.

The book is illustrated by two puerile paintings and numerous photographs. The majority of the photographs are either slightly out of focus, over enlarged. retouched, or too contrasty.

Altogether this book gives an impression which is not only unfavorable, but also distasteful.—O. S. Pettingill, Jr.

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Correction—We were very sorry to find that after we saw the last proof of the March *Bulletin* the printer inserted an erroneous line on page 54 of Ludlow Griscom's able book review. The line is the fourth line from the end of the first paragraph. Instead of, "their habitats . . ." it should read:
"habitats, the Red-wing occurs in C only. The Lincoln's Sparrow is assigned to D"

Report of the Affiliations Committee, as Adopted by the Wilson Ornithological Club at the 1940 Annual Meeting

The Wilson Ornithological Club, at its meeting in Louisville, Kentucky, in November, 1939, appointed a committee to examine into the desirability of closer affiliations between the various ornithological organizations. After some consideration, this committee offers the following statement of policy:

1. The proper type of affiliation between the Wilson Club and other ornithological societies seems highly desirable, in that it is capable of offering certain advantages to each of the organizations involved.

2. Since the Wilson Club has become national and international in its membership, there seems to be no good reason why affiliation should be limited to societies in any particular region. Should any society of the proper scope and membership wish to affiliate with the Wilson Club, your committee favors placing the matter before the Council for action.

3. Affiliated societies should in general be at least state or province-wide in membership, and should be active in ornithological work. It is suggested that the four strong and active state societies already affiliated with the Wilson Club, namely the Tennessee Ornithological Society, the Nebraska Ornithologists' Union, the Kentucky Ornithological Society, and the Iowa Ornithologists' Union, be taken as examples of the type of organization with which affiliation would be desirable.

4. Affiliation should be carried out only when there is practical unanimity among the members of the affected organizations as to the desirability of such a step.

5. It is not the intention or desire of the Wilson Club to infringe upon any other ornithological group. Therefore, although affiliation will not be refused any organization of the proper scope and membership, groups affiliated with other national or international ornithological societies will not be urged to affiliate with the Wilson Club.

6. No financial consideration on the part of either organization should be involved in affiliation.

7. *The Wilson Bulletin* will be glad to exchange with the publications of affiliated societies. In addition, *The Wilson Bulletin* will publish as a service to affiliated organizations brief notices of their meetings, programs, field trips, and other activities. It is hoped that the journals of affiliated societies will perform a like service for the Wilson Club.

8. *The Wilson Bulletin* will serve as a possible organ for publication of the results of studies going forward within the affiliated societies, where the scope of these studies is too great for publication in the journals of local organizations.

9. Where it may be desirable, the Wilson Club will welcome the meetings of affiliated societies in connection with its own annual meetings. Separate sessions may be held as desired, but joint programs of great interest will be possible through such an arrangement.

10. Your committee believes that affiliations along the lines outlined above will result in much good to each of the organizations involved, will strengthen each of the organizations without any loss of individual entity, and will help to present a more nearly united front of those persons in the United States and Canada who are vitally interested in ornithology in particular, and in the broad problems of conservation as well.

Respectfully submitted,

A. F. Ganier
S. C. Kendeigh
Myron H. Swenk
Maurice Brooks, *Chairman.*

TO OUR CONTRIBUTORS

Our members are asked to submit articles for publication in the *Bulletin*. Manuscripts will be accepted with the understanding that they have not been published or accepted for publication elsewhere.

MANUSCRIPT. Manuscripts should be typed on paper of good quality and of letter size (8½ x 11). Write on one side only and use double spacing. The title should be brief and carefully constructed so as to indicate clearly the subject. Ordinarily the scientific names of the birds treated should be given and should appear early in the article. Most articles should have a brief summary at the end.

ILLUSTRATIONS. Photographic prints, to reproduce well as half-tones, should have good contrast and detail. Please send prints unmounted, and attach to each print a brief but adequate legend. Do not write heavily on the backs of photographs.

BIBLIOGRAPHY. Literature cited should ordinarily be listed at the end of articles. These citations should be complete and references to them in the text should be made by the year of the citation and the exact pages referred to.

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